ENGINEERING NEWS.

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GEO. H. FROST.....PROPRIETOR.
J. W. ADAMS.....EDITOR.

SATURDAY, NOV. 19, 1881.

THE attention of contractors is called to the letting of the large work—Lock and Dam No. 7—on the Monongahela River, 84 miles above Pittsburgh. J. H. Harlow, C. E., of 81 Wood street, Pittsburgh, is engineer of the work. Dam No. 8 is under the direction of Col. W. E. Merrill, of the Corps of U. S. Engineers. No. 9 is already built. When No. 7 and 8 are completed the river will be navigable to Morgantown, in West Va., 102 miles above Pittsburgh. These locks will have 6 feet of water on the miter sills. By means of machinery put in this season the gates at Lock No. 1 are now operated in half the time formerly taken.

THE IRON AND STEEL manufacturers throughout the United States are making every possible effort to extend their capacity in order to more promptly meet the enormous demand for iron and steel and its products. There are well-grounded doubts as to whether productive capacity is equal to demand. There is just enough uncertainty about it to lead to tardy and over-cautious efforts to increase production. The remembrance of the four dull years from 1874 to 1878 suggests the possibility of four more such years at no very distant day. With all this to be remembered, manufacturers are extending and increasing and improving in a manner which shows their confidence in the future. The manufacture of rolling-mill machinery is being pushed with unusual vigor. Every such establishment is overcrowded. Old rolls are going out, and new ones are going in. Puddling furnaces are being erected in over thirty rolling mills. Blast furnaces are being overhauled. Minor economies are studied into, and a greater output is being made possible with the least possible additional expense. As soon as the present rush is over, cheaper iron and steel will be the product of the new conditions which the industry is making for itself.

The extraordinary demand has not resulted in such an advance of prices as would have taken place at any other time. Pig iron in the East is selling at $22 to $23 for forge, and from $25 to $27 for foundry. Chicago prices run from $27 to $31; Chattanooga, $20 to $24. Merchant bars are scarce to new customers; orders have accumulated covering the product for from two to four months; prices from 2½ to 3c. at mill. Orders are placed with difficulty. Demand is remarkably active. Consumption is gradually increasing, but will fall off slightly during the winter months. The output, it is believed, is about equal to the demand; but the anxiety of buyers and the scant stocks served to bring about an advance to the present limits. The margin of profit among consumers is sufficient to allow the payment of manufacturer's prices. These have been made with the possibilities of importations in view. Much business is turned away yet, and buyers are running on very short allowances. The activity in foreign markets protects prices here and offers no inducements to buyers to delay purchases. A number of old mills have been started, and the product is much increased.

The railroad builders are already providing for next year's requirements in the way of bridge iron, structural shapes, nails, spikes, bolts, etc. Railroad material has advanced under the heavy demand, but the weight of opinion inclines to the belief that with the opening of the building season prices will favor buyers. This opinion depends, of course, on the number and magnitude of new enterprises and requirements which may spring up between now and next summer. It is not to be supposed, however, that the extraordinary demand will be long permitted to exist for want of facilities for meeting it.

THE STRENGTH OF THE CABLES OF THE EAST RIVER BRIDGE.

It would seem by an article in a prominent daily city paper of the 10th inst. that the Board of Trustees of the East River bridge are not a unit in their estimate of the value of the structure. One of them is made to say by the reporter that "our city (New York) is not a jealous city, but then to ask it to build a bridge in order to send its trade to a neighboring city is asking a good deal even from the best of natures." We trust the reporter has misquoted or misunderstood the trustee in stating that the policy of building a bridge from the city of New York to a neighboring city was at this day, in his opinion, a measure of questionable propriety.

In our experience we can recall but a single parallel case to this. Many years since a railroad meeting was held in a town in Kentucky, to take into consideration the propriety of building a railroad across the border of the State. A prominent individual in addressing the meeting expressed his views as "in favor of building railroads *into* Kentucky, but averse to building them *out of*," having in his eye, probably at the time, the uncertain tenure of property which could make itself scarce "by an early train."

It would appear that there are individuals in our midst who think that the prosperity of New York City is less due to the fact of business being *drawn* here by the natural gravitation of capital to great business centers than being *held* there by the obstacles attending a change of location.

It is scarcely necessary to waste words or argument upon this, but as the opinion, or something like it, of our worthy bridge trustee, is held by very many otherwise sensible people, for their benefit we would offer one suggestion.

New York City is overcrowded, and the enormous increase of wealth and population which will always tend to center here, must have an outlet for overflow, which overflow, so far from abstracting from her prosperity, would still aim to hold to her, as it were by hooks of steel. What so proper, then, as for her to foster, in all possible ways, enterprises which, recognizing the inevitable, facilitated the movement, but at the same time gave it such direction, that the wealth accruing from the increased area of trade, should be directly tributary to her, and represent taxable property in her own State, and not in New Jersey. This policy, nature has aided by the narrowness of the East River as compared to the Hudson, and no development on Long Island shore could detract from the center and source of its increase, New York City.

But this is not the object of this writing, which is rather to show, in brief, that the cost of a few additional tons of steel, over which the short-sighted are howling as an evidence of mistaken calculation on the part of subordinate engineers, is in reality but a healthy outgrowth of expanded ideas of the importance of this structure in the early future, not to Brooklyn alone, and the whole of Long Island, but to the city of New York. In the fourteen or fifteen years which have elapsed since the bridge was designed, such enormous strides have taken place, and are now taking place daily, in the volume, weight and character of railroad intercommunication, and in the means for its facilitation, that had the structure been born complete at that day, as it was designed, however perfect it may have been in workmanship, it would have proved utterly inadequate to meet the demands which it is now evident will be made upon it. Such things, for instance, as Pullman cars, weighing over thirty tons, had never been thought of at that day, and when the elder Roebling prepared his design for using his wire, he was far-sighted enough to see the value and probable introduction of steel wire for economic use, and so embraced it in his scheme as a possibility; but he could not have foreseen, nor did he foresee, that the manufacture of steel bars would have grown to such proportions at this day, and could be furnished at such prices, as completely to revolutionize the whole art and science of construction.

The bridge, when designed, was in advance of the highway bridges of the day, but its purpose was but that of a highway bridge. City travel, as then conducted, required cars of but two or three tons weight, and the bridge, as a connection between two cities merely, was, as designed, all that could be desired.

As the construction progressed, the trustees, under an enlightened policy, adapted steel wire for the cables in lieu of iron, thus diminishing the weight, while preserving its strength. The steel comes from the manufactory in bundles of a few feet in diameter. A piece cut from one of these bundles and laid upon the ground would spring into a curve of short radius. This tendency to curve would render the construction of a cable of straight wires almost impossible, and it became necessary to straighten it, which was effected by passing it through a machine, which, bending it in all directions, destroyed the tendency to take a curved shape when released. The steel was required to bear a test strain of a certain amount per square inch. It will be perceived that by taking a piece of curved steel and pulling it straight, the inside or concave fibers will be subjected to a greater strain than those of the outside, and by subjecting the wire to a given tensile strain up to its elastic limit, the concave fibers would be strained beyond that limit, while the excess of strength of the upper fibers would not be available.

The contract required a certain size and weight of wire, tested to bear a certain tensional strain, which, as we have seen, was the mean strength of all the fibers; the consequences were, that while the wire came up to the contract in strength as a whole, certain portions of every wire in the coil were stronger than the average. The experiments of the engineers resulted in requiring the wire to be manufactured straight, so that when unrolled, instead of springing into a coil, it takes a straight line. The consequences were, that no portion of the wire when strained, was subjected to more than the mean strain on all its fibers, and from this uniformity of strength it could be strained nearer its elastic limit with safety, without fear of any undue strain on any of its fibers. The result of all this is that the present cables are one-fifth stronger (12,000 to 10,000 tons) than their estimated strength before construction, and this is effected without adding one cent to their cost, being of the same size and weight as before; their original dimensions when designed being predicated on the limited knowledge of the peculiarities of a new material. The question would naturally arise: How shall we utilize this excess of strength to the best practicable extent? It is wasted strength unless this be done. The rapidly-increasing weight of traffic pointed unmistakably to increased demands on the capacity of the bridge; to what extent it was impossible to say but to neglect so obvious an opportunity for bringing up the structure to a uniformity of strength throughout, would have been culpable in

the extreme, and the engineers have accordingly provided for an increase in its strength where only increase, after the construction of the cables, was practicable, namely, in the suspended superstructure.

It must be remembered that this is a suspension bridge, and after every effort possible has been made, the bridge itself has a tendency under varying strains to a change of shape in the roadway. Absolute stiffness from end to end is impossible; but a certain regularity is secured in the movement of its parts by the aid of the stays, and throwing as much of the weight as possible on the end supports at the towers. The trusses, therefore, which are essential to this stiffness, are increased in strength and weight as they approach the towers, and the increase in weight called for is largely used in this direction, in order to utilize to the best possible effect the surplus strength of the cables.

Now the caviler will say: This is all very well, but why could not this have been stated when the first estimate for the weight of the superstructure was made. To this we answer, that we are not apologists for the shortcomings of the trustees of the bridge—if shortcomings there be—not enjoying their personal acquaintance, and are in ignorance whether or not they have been so far in advance of the knowledge of their day as to have anticipated the good results which will follow their action in reference to increasing the material of the bridge, nor whether, like the rest of us, they are indebted to the "evolution" process, through which they have themselves developed as the weight of their responsibilities grew upon them. We know nothing of all this, but we do know what the bridge was originally designed to be, and without any disparagement to the talents of the elder Roebling, we believe that it is entirely owing to what the *Times* is pleased to consider as the "stupidity" of the present engineers, that the structure will be capable of withstanding, without sensible yielding, all the strain which by any possibility it can be subjected to; and when completed we are confident it will reflect the greatest credit upon all who have been instrumental in perfecting it, with an eye to its future needs, and in disregard of the clamors which it might provoke.

THE EAST RIVER BRIDGE.

NEW YORK, Nov. 12.—Statements of a disturbing character are beginning to circulate in scientific and engineering circles respecting the East River bridge, the substance of which is that it will be impossible to complete the present structure with due regard to the public safety. It is admitted that there have been grave mistakes made as to the tremendous strain which the cables have to bear; and it may result from this that Congress at the approaching session will be asked for permission to erect a third pier in the middle of the river. The impediment to navigation in that case, however, would be such as to render it morally certain that the application would be refused, in which case the structure, for which the taxpayers have already given $12,000,000, would remain as an elephant upon our hands. For the moment the company is perplexed as to whether it should suspend the work or go ahead and finish it somehow, at the same time that the public are growing more and more weary about the loose way in which the financial management has been conducted. When Count Ferdinand de Lesseps was here he expressed himself in regard to the structure in such terms as to warrant the conviction that, as a scientific engineer, he had grave doubts as to the ability of the cables to bear the strain that was to be put upon them. His opinion has never been permitted to get into print until now, but it is none the less significant. The late Mayor Havemeyer, before he died, predicted that the taxpayers of New York would regret the day that they ever sanctioned this undertaking, which he never ceased to characterize as a colossal job, and from the present aspect of the situation it looks as if the old gentleman's prophecy was in a fair way of fulfillment.—*Chicago Times.*

It might appear as in the light of fighting windmills to gravely attempt to combat such statements as the above, in which there is not the semblance of truth from end to end; but quoting the old proverb, "as error will travel ten leagues while truth is putting on his boots," we must be pardoned if we notice one sentence of the paragraph, where reference is made to the opinions of Count de Lesseps.

Count de Lesseps was neither an engineer, as there stated, nor ever professed to be one. On the contrary, at his reception by the Society of Civil Engineers in this city he distinctly disavowed all claims whatever to such distinction. His early life and his subsequent career were those of a diplomat, and when he visited the bridge no one thought of asking his opinion about its merits as a work of engineering, nor did he give it as one whose opinion would have any weight, on a matter so wholly beyond and foreign to his studies as it certainly was to his experience. He could not but be struck by the magnitude and character of the work; nor could he withhold the expression of his opinions, which were given unsolicited and unqualifiedly as that of admiration for, and belief in, the success of the undertaking.

We were not present at Ex-Mayor Havemeyer's death-bed, and so cannot say what he might have uttered before he died. There is no official record of any such opinion as having been given by him. There are many persons who wonder that the wire cables swing even now, without any load upon them, without rupture, never having seen such a thing before, and in utter ignorance of the principles of their action, and Mr. Havemeyer may have been one of them; his election did not turn upon his engineering skill, nor upon his opinion in the matter one way or the other; nor did the fact of his being elected mayor of a great city give his opinion on a subject of which he was profoundly ignorant any special weight.

GERMICIDE.

The originality of Prof. Huxley's ideas is unquestioned, but perhaps the most novel of his announcements is one made to the Society of Arts, that "a co-operative store for the supply of good advice" has been started. The good advice is to be offered to those who are in peril from the ignorance or carelessness of builders, plumbers, sanitary engineers, inspectors of nuisances, and other ills of the like description to which the householder is heir by reason of defective drainage. To remedy this danger to life, the London Sanitary Protection Association will, for a nominal fee, inspect the householder's premises, and tell him what poisonous gases he and his family are inhaling, and how to prevent their entrance.—*N. Y. Sun.*

Taking occasion in an article in a previous number to allude to the many devices which the public are asked to purchase and make use of, as a sovereign remedy for evils which are magnified by the vender, to his evident profit, we notice among them the above, "Germicide," which consists in a contrivance by which a solution of chloride of zinc is allowed to trickle down through the soil pipe of a dwelling and intercept the disease germs which are assumed to be constantly ascending the pipe on their deadly mission, and strangle them then and there, and all at the trifling expense of five dollars in hand, and twelve dollars a year paid quarterly; and for this, a joint stock company is established, with a capital of $300,000, with president, treasurer, secretary, registrar, etc. It is stated that no matter how perfect the plumbing or the condition of the water traps, these things will get through, and what is likely to follow is not left to the imagination by any means, but is made the most of. This is followed by a list of over fifty of our physicians, and some six hundred names of institutions or prominent individuals who are using this contrivance as among those who have tested and approved the method. This would represent a return of $11,000, already, and if properly worked, would at this rate be sufficiently remunerative. If the bearer of any of these six hundred and fifty names will be pleased, in the cause of sound sanitation, to state as of his own knowledge, that previous to the use of this Germicide he was troubled with disease germs from sewer air (we will not ask him to say that he has ever seen one), and that since its use he has ceased to be so troubled, he will confer a public favor by converting a skeptic, who, with the known enthusiasm of new converts, will be able to do some good to suffering humanity.

It did not need the signature of some fifty physicians to attest the fact of chloride of zinc being a good antiseptic—we all know that—but we want the evidence that something more than a disagreeable smell has been eliminated by this contrivance, prior to commending it to the public.

ALBANY AND GREENBUSH BRIDGE.

This enterprise was started nearly ten years ago, to afford a highway connection between the village of Greenbush and city of Albany, in connection with a system of projected railways, independent of the New York Central system, which has a practical monopoly of the existing bridges. After various vicissitudes and shifting of interests, the charter for the A. & G. Bridge finally fell into the hands of certain New York parties last spring, who are now driving the work to a rapid completion, and it is expected that by the first of the coming year the work will be finished, so far as highway communication is concerned. The whole work has been pushed with unprecedented rapidity, when its magnitude is once considered it reflects great credit upon the management in all its departments. The site of crossing is at South Ferry street, Albany, about a quarter of a mile below the steamboat landing, which involved exceptional consideration for the navigation interests, demanding an uninterrupted water-way of 175 ft. either side of the porch pier. The bridge is a double-deck structure, with a highway 27 ft. above mean water and the railway (double track), 17 ft. 6 in. above the highway. The length of the main river bridge between bulkhead lines is made up of three spans, viz., the draw span in center, of 401½ ft., flanked on either side with a fixed span of 252 ft. The Albany approach is on a rising grade of 6 ft. per 100, and consists of a short stretch of retaining wall work and three plate girder spans of 36 ft. On the Greenbush side the approach consists of two spans of 153 ft. on a level grade, and on the rising grade of 6 ft. in 100, similiar work to that on the Albany side. The whole length of the work, from Broadway in Albany to Broadway in Greenbush, the initial points of the highway approaches is 1,569 ft. While there is nothing novel in the construction of the work, its magnitude is such as to render it of more than passing interest, apart from the rapidity with which it is being executed. The spans are of massive proportions, the end posts of the river fixed spans weighing 1,700 lbs. each, with end top chord pins 9 in. in diameter. The trusses are 45 ft. deep, lattice channel bar posts, and Phœnix column top chord. The draw span, 50 ft. deep at center, tapering down to 25 ft. at ends, is substantially constructed on the same details as were used for the Harlem River draw at the end of Eighth avenue—built last season—only of course on a proportionately more massive scale. The turn-table is half river bearing and half center bearing, and will be operated with one of Joseph Edwards' double-cylinder oscillating engines, with frictional gearing, which has worked so admirably in the Harlem draw. As an example of the rapidity with which the work has been progressed, it may be mentioned that the whole of the river masonry, foundations, etc., consisting of 2,500 piles—500,000 ft. timber—over 5,000 yards masonry and coping, was finished between June 1 (when first pile was driven) and Oct. 27, when the last coping stone was laid, less than five months intervening. In connection with the piers a rather difficult problem presented itself, in that the simplicity of framing required the trusses to be framed square with the axis of the bridge, while the piers

had to be on a skew of 15°; further the width of river being rather contracted at point of crossing, as compared with the width above and below, it was desirable to so design the piers as to contract the water way as little as possible. To "square" the trusses (28 ft. between center) in the piers required 14 ft. of pier width, which was obtained by corbelling out the masonry for four courses below the coping, which, together with offset of the coping, gave 15 ft. in width, while the pier was built 12 ft. thick below the above corbelled offsets. The stone used for all the masonry is a siliceous limestone, from the Sandy Hill Quarry Company (back of Fort Edward), and it is but justice to that quarry to say that its facilities alone made it possible to do this work in one season. There is no superior stone east of the Alleghanies, and it lies in beds or great sheets of convenient thickness. The piers are coped with cut granite from Maine quarries. The general contractors for the whole work (exclusive of approach masonry) are Clarke, Reeves & Co., of Philadelphia, with Smith & McGaw their sub-contractors for masonry and foundations. Mr. Alfred P. Boller is Chief Engineer, with Mr. E. L. Cooke as Principal Assistant Engineer in immediate charge of the work, and Prof. W. H. Burr, of Troy, Inspector of iron work at Phœnixville. The cost of the Albany and Greenbush bridge, with its approaches complete for highway service, will closely approximate $600,000.

THE KINEMATICS OF MACHINERY.*

Kinematics is a branch of geometry, treating of the comparison of motions, or the science of pure motion, excluding the conception of force as a cause of motion.

We quote from the introduction by Professor Thurston as follows:

"A systematic notation and the development of a system of scientific expression of the laws of machine movement, in which such a notation is used, constitute a grand feature of this work. These symbols are simply and relatively combined to represent any machine, and a number of convenient contractions render their use more convenient in the more frequently occurring cases; and the identity of visibly differing machines, or the radical differences between mechanisms seeming to the eye almost identical, become at once evident when the material disguise, in which they appear to the untaught mind, is stripped off, and they become known only through their kinematic or true mechanical relations."

We append a few of these "convenient contractions:" Two forms of rotary engines ($C'''_3\ P_\perp{}^n$ and $(C'''_3\ P_\perp)^n$; Hooke's joint, $(C_{\perp_3}\ C)^n$, which also embraces, with slight modifications, the disk engine.

If any of our mechanicians, machinists or inventors have the time to spare in this busy world to seek to instruct themselves in this branch of science, we commend to them this little book as a proper introduction to the study, and the clearest exposition of the subject within reach; but would remind them that, in all probability, such men as Arkwright, Jacquard, Watt, Cartwright, Whitney, Blanchard, Treadwell, Bigelow and a host of names, some of whom have achieved fortunes, and all of them fame, never heard of such a science, but found the geometry of the old masters sufficient for their needs.

If the would-be inventor possesses a spark of the divine afflatus, he will not need the aid of this new science, and if he be without the requisite genius, a course of Kinematics would be of about as much use to him as a treatise on the Hebrew points.

With the highest appreciation possible of Prof. Thurston's scientific ability, we must be permitted to congratulate our mechanics upon a fact, stated and deplored by the Professor in his introduction, as follows:

"Nearly all great advances of this character, like nearly all great mechanical inventions, are a generation, at least, in taking their place in the world; it is to be hoped that this may prove an exception to the rule."

* No. 54 of Van Nostrand's Science Series, being two lectures relating to Reuleaux' methods, by Prof. A. B. W. Kennedy, C. E., with an introduction by Prof. R. H. Thurston, A. M. C. E. N. Y., D. Van Nostrand. 1881.

A GREAT OFFICE BUILDING.

Mr. Cyrus W. Field has bought the property facing on Battery place, lying between Broadway on the east and Greenwich street on the west; six competitive plans were offered by as many architects, for an immense office building to be erected on the lot, and the design of Mr. Edward H. Kendall, 71 Broadway, has been selected. The building will be 56 feet 4 inches on Broadway; 171 feet 9 inches on Battery place; 63 feet 5 inches on Greenwich street, and 168 feet 3 inches on the northerly line. The cost is to be $500,000. There are to be 10 stories above the cellar and basement. The building will rise to the height of 150 feet within the walls, and above all there is to be a circular lantern or cupola, with a flag-staff and electric light, the highest point from the ground being 250 feet. The building will be of Milwaukee brick, with Belleville stone trimmings, the same kind of stone used in the construction of Trinity Church. The portion at Battery place and Greenwich street is to be used as the press-room of the *Evening Mail*, the property of Mr. Field. The rest of the floors will be laid out in offices, except the top, which is to be used for the editorial, reportorial and composing rooms of the *Evening Mail*. There is to be a turreted oriel at Battery place and Broadway and at Greenwich street and Broadway. The offices on the Battery place front will command an unsurpassed view of the Battery Park and the harbor.

THE NEW FULTON MARKET.

Active operations have been in progress for some time past at Fulton Market, this city, the old landmark and eye-sore gradually yielding, in sections, to a more imposing and commodious structure. The original market was built of brick and granite, a fact which would never have been revealed even by the closest inspection, so covered had it been with wooden sheds, and it occupied the three sides of the rectangle facing Fulton, Front and Beekman streets. It was 30 feet wide, and, taken altogether, was 500 feet long. The court-yard, which opened on South street, was designed for the use of trucks when loading or unloading. In laying the foundations for the walls of the old market the builders had gone down about five or six feet below the road-bed with a trench in which they laid, longitudinally, heavy beams; another course was laid transversely, and this was topped with a course parallel with the first. Upon this the masonry was constructed. These timbers were of white and yellow pine, and although they had been buried 61 years, they were found to be as sound and perfect as when first cut.

The date of the erection of the conglomeration of wooden sheds, which entirely hid the original structure, can only be told segmentally, as the additions have been made from time to time in accordance with the taste, convenience and depth of pocket of the various builders. The style of architecture of the completed market—as it appeared before the work of destruction commenced—was exceedingly unique and varied, belonging to none of the accepted orders and having none of the peculiar characteristics by which one learned in these things could trace the school from which it came. Nevertheless, if we are to believe that human nature has undergone no change while jogging down past centuries, then the order may date from the first shed man erected for his protection. It had no national significance, neither had it any feature peculiar to Gotham, but was just such a collection of sheds of all kinds, sizes and materials as may be found in the dilapidated part of any large city. The court-yard had become filled with booths, the only passage-ways between them being small walks.

As a reporter of ENGINEERING NEWS was noting the operations now in progress, he was accosted by a pleasant-voiced individual, who, in the course of a brief conversation in which he gave some interesting experiences connected with the market in years gone by, said: "Since I left New York, a few years since, I have been in almost every civilized and uncivilized country in the world, and have seen buildings in all of them which brought my thoughts right back to Fulton Market. But the most perfect representation I saw was in a new mining town out West, where sheds, built of rough boards, was all 'the city' had in the building line. After a tornado had played with those sheds a little while, it left them an exact likeness of Fulton Market."

Notwithstanding the filth and inconvenience of this market, and of its counterpart on the other side of the city, it was with the utmost difficulty that preparations could be made to replace it with a more substantial and convenient structure, and so wedded do people become to one place in which to buy that the recent experiment of a cleanly and better located market uptown failed.

Through the courtesy of the architect, Mr. Douglas Smyth, of 137 Broadway, we were shown the plans of the new building, which will occupy the same site as the old one, will be 30 feet wide and one story high, except at the corners and at the center of the Front street side, where towers will give ample room for offices or for storage. The materials will be brick and iron with trimmings of terra-cotta, and every attention will be given to durability, light and ventilation.

Clusters of piles are now being driven for the foundation of the walls, and their distance apart and depth vary according to the nature of the materials encountered, in some places being "head to head" and 30 feet in depth. In some cases when driving these piles difficulty was experienced from their encountering the remains of the crib work of old docks. This is explained by the fact that the shore line was once at Pearl street, but had gradually advanced to its present limits. The filling is clean sand and silt, with no indications of refuse of any kind.

Upon these piles heavy pine timbers will be placed, then the stone-work for a few feet and finally the brick-work.

For this work the Board of Apportionment has appropriated $80,000, the contract price of the building being $69,500. The plans have been so drawn that the court-yard can at some future time be covered with a structure of similar design to the one now going up.

Those who occupy that part of the market known as the court-yard have not been disturbed, and provision has been made for those who occupied the market building proper by erecting small sheds on the curbs of South and Fulton streets.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

At the meeting of the Society on Wednesday, Mr. Charles Macdonald presided, with a large number of members in attendance. The death of Henry Cartwright, member of the Society, was announced. The subjects of discussion were: Protection against the Slip of Clay Slopes by Protection of the Foot by burning the Clay in Position; the Latent Thrust of Earthwork and Stability by Retaining Walls; the Details of Apparatus for Supplying Steam, Heat and Power to Districts in Cities, and Safety Appliances for Elevators. The regular ticket for officers of the Society for the coming year is as follows: For President, Ashbel

Welsh; Vice-Presidents, Jas. B. Eads and Wm. H. Paine; Secretary and Librarian, Jno. Bogart; Treasurer, J. J. R. Croes; Directors, Thos. C. Keefer, Thos. L. Casey, Jos. P. Davis, Geo. S. Greene, Jr., Geo. W. Dresser. The election will be held Jan. 18, 1882.

LAST DAYS OF THE GREAT FAIR.

THE TIME OF CLOSING MADE LATER AT THE REQUEST OF THE EXHIBITORS.

The semi-centennial exhibition of the American Institute at Third avenue and Sixty-third street, New York City, will not be closed on the 26th of this month as was intended by the Board of Managers, but at the asking of the exhibitors will continue the fair until the third day of December. Machinery Hall is more interesting than ever before this year, and is visited by very many. The art gallery is complete and very beautiful; the building is lighted at night by seventy-four electric lights; which give a clear and bright light, and renders the use of gas lights useless. The famous Ninth Regiment band, larger than ever before, under the leadership of M. Arbuckle, the well-known cornet virtuoso, gives a grand concert every afternoon from 3 to 5 o'clock, and every evening from 8 to 10 o'clock, at which hour the fair closes. At each concert Mr. Arbuckle plays one of his cornet solos, which is greatly enjoyed by all who hear it. Solos at every concert are played on the clarionet by Karl Kegel, on the euphium by J. G. Frank, on the saxophone by F. Sipp, on the sarusophone by M. Reine. But a few opportunities are left to visit the fair, and a visit should be made at once or it may be too late.

THE NEW YORK, SUSQUEHANNA AND WESTERN RAILROAD COMPANY.

The line of this road extends from Jersey City (at its point of connection with the Pennsylvania Railroad), via Two Bridges, Stroudsburg and Scranton, to the heart of the Wyoming coal fields of Pennsylvania; also from Two Bridges to Unionville, and thence by a leased line to Middletown, New York, at which point connections are made with the New York, Lake Erie & Western, and the New York, Ontario & Western. Eighty-five miles are now in operation.

The line is an extension of the old Midland Railroad of New Jersey from Two Bridges to Scranton via the Delaware Water Gap and Stroudsburg. The first section of the extension is now about one-half finished, and at the present rate of progress will be opened for business about the 1st of next April.

The road is being built by the New York and Scranton Construction Company, whose officers are:

W. S. Dunn, of the firm of H. P. Clafflin & Co., President.

R. K. Dow, of Claremont, N. H., Vice-President.

Chas. Minzesheimer, Treasurer.

W. O. McDowell, Secretary.

Hon. G. A. Hobart, of New Jersey, Manager.

D. H. Wood, Chief Engineer.

The headquarters of the company are at Nos. 5 and 7 Courtlandt street, this city.

At the same place are the headquarters of Judge H. R. Low, who has the contract for the first 45 miles, upon which he has at the present time about 1,500 men.

The bridge over the Delaware Water Gap will be 1,600 feet long and will cost about $100,000. It will be built in the most durable and substantial manner. The Delaware Bridge Company, of 52 Wall street, this city, have the contract.

Sixty-pound steel rails have been purchased for the entire road, and for the first 45 miles have been delivered. The rolling stock is all under contract.

Negotiations are now in progress for terminal facilities at three different points on the New York end of the line. The entire road will be in running order not later than January, 1883, and much sooner if materials can be delivered as fast as required.

The N. Y. S. & W. R. R. Company owns a controling interest in the stock of the Pennsylvania Anthracite Coal Company, which holds in fee 3,000 acres of coal lands, and has a daily output of 1,100 tons, which will be doubled upon the opening of new shafts now being constructed.

It has also contracts with other producers for the carriage of over 1,200,000 tons per annum, thus insuring from this industry alone an annual freightage approximating to 2,000,000 tons. The company now controls at least 150,000,000 tons of coal, or an output of 2,000,000 of tons per year for 75 years, and has advantageous contracts offered, which, if accepted, would increase the amount of coal controlled to 200,000,000 of tons, or 2,000,000 per year for 100 years. The line traverses a country abounding in farm and dairy products, and rich in deposits of iron and zinc.

PERSONAL.

Harvey D. Webster is elected Chief Engineer of the Indianapolis Fire Department.

Messrs. Hilton & Menger, engineers, of Paterson, N. J., have charge of the building of the Paterson Extension Railroad; Messrs. McKiernan & Bergin, contractors.

E. B. McCauley, Cashier of the Philadelphia Bridge Works, was accidentally poisoned while traveling in Wyoming by eating bread in which a careless cook had used arsenic instead of baking powder.

Mr. Philip Golay, C. E., late in charge of Ohio River improvements at Grand Chain, has taken charge of the long trestle bridge across Lake Pontchartrain, on the New Orleans & Northeastern Railroad. Address, box 2,484, New Orleans, La.

C. C. Waite is talked of as the coming Superintendent of the Cincinnati Southern. Mr. Waite is a son of Chief Justice Waite. He now occupies the position of Assistant to President Jewett, and was formerly General Superintendent of the Little Miami.

The Mormon tabernacle at Salt Lake City, which has been 28 years in process of construction and is not yet completed, has granite walls nine feet four inches thick, is 250 feet in diameter and seats 12,000 persons. It is a very perfect whispering gallery, and the dropping of a pin or the rustle of a dress can be heard from one side to the other.

A. H. Emery, Civil Engineer, of New York, has been awarded a grand medal of honor at the Exhibition of the Massachusetts Charitable Mechanics' Association, for a testing machine capable of testing with equal accuracy an ingot of steel or a horse-hair. The Examining Committee consider it the greatest invention in mechanics of the present century.

Thursday of last week a locomotive struck a woman walking on the track near Mecosta, Mich., hurling her into the air and landing her in the ditch. The train was stopped, and the engineer and conductor hurried to the scene. The latter proposed to have a couple of men pick her up and put her on the train to be carried to the village for a doctor, but she told them to go on with their wagon—no man should lay hands on *her*; she knew her business, and when she got ready to get up and go home she would do so.

It is believed that the long-sought-for cure for snake bites has at last been found. M. de Lacerda has achieved remarkable results in this direction with permanganate of potash. In the first experiments the solution of the antidote injected was too strong, and destroyed the tissues of the animal under treatment. When, however, a one per cent. solution was used, no inconvenience was produced by it, and twenty-eight out of thirty animals poisoned were cured. In each case the trouble disappeared within five minutes, and within half an hour the dog was running about as if nothing had happened.

Ellison McLean, Civil Engineer, in charge of the surveys of the new tracks of the New York Central, now being laid between Rochester and Buffalo, was run over while at work, by a train, about two miles west of Byron Station, at noon on the 11th. Mr. McLean had his instruments set between the two passenger tracks and at about half-past eleven o'clock the Pacific express, a few minutes late, came rushing up the grade. He stepped on to the east-bound track but failed to notice a train that was being "pushed" toward him till it struck him and knocked him against the express, which ran over his right foot, crushing it in a horrible manner. He died at two o'clock. Mr. McLean was forty-two years old. He was a skilled surveyor and had had many responsible positions in the line of his profession. His brother-in-law is the newly elected State Treasurer of this State.

Dr. Siemens, the great electrician, has given some account of his early struggles to the members of the Midland Institute, at Birmingham. He began life in a German university, where he made some discoveries in electroplating. Finding no appreciation of his talents in his native country, he determined to go to London, and arrived there friendless and with only six cents in his pocket. His ignorance of the English language led him into many amusing blunders. His attention was attracted by the sign "Undertaker," and he applied to the proprietor of the shop, thinking that tradesman would undertake to negotiate his business and bring his inventions before the public. At length Siemens obtained an introduction to the Elkingtons, who were then experimenting in electroplating. To his chagrin he found that they were acquainted with the processes which he thought he had discovered. The firm, however, appreciated the boy's genius, and opened up for him the career which has placed him in the foremost rank of electricians.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.*

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 460.)

CXXXVIII.—AUGUSTA, GA.

Augusta, Georgia, in lat. 33° 28′ N., long. 81° 54′ W., is on the south bank of the Savannah River, 132 miles above the city of Savannah by rail and 266 by river, and 147 ft. above mean low tide. The city is on a level plain, the soil of which is composed of alternate layers of sand and clay, with coarse sand and pebbles for a depth of 75 ft. It was laid out by Gen. Oglethorpe in 1735, incorporated as a town in 1798, and chartered as a city in 1818.

In March, 1828, the city council granted the right to furnish the city with water to Thomas McGrew, who built what is known as the Turknett Springs Water-Works, taking the water from a spring 2¼ miles southwest of the city. On July 15, 1829, he conveyed the works to Hon. Wm. Hale, then Mayor of the city. The city purchased them from Mr. Hale on March 26, 1840, for $1,800.

The supply and distribution were then increased. The water is brought to the city by native pine logs, of 6-in. bore, and the distribution is by 6-in. and 3-in. logs. The service pipes were 3-in. logs, with an upright at the end, the taker drawing

* Copyright 1881.

water through a 2-in. orifice by simply withdrawing a pine plug. The supply is by gravity with a head of 43 ft. from the springs to the city.

Since the introduction of another supply, the takers of the Turknett Springs water have gradually decreased, owing principally to the high price of $20.00 per family or hydrant, from 291 in 1876 to 184 in 1879 and 176 in 1880.

The capacity in 1877 was 186,256 gallons in 24 hours. This source of supply will be discontinued on Jan. 1, 1882. The disbursements from 1840 to Jan. 1, 1-81, were $302,708.30, and receipts, $101,-815.78.

In 1859, the city authorities advertised for plans for water-works from other sources.

The plans proposed by Alfred W. Craven, C. E., were adopted, with some modifications, suggested by William Phillips, C. E., under whose charge the works were constructed, and water introduced on March 26, 1861.

Water is taken from the Augusta Canal, which was built to furnish water power, and is fed from the Savannah River seven miles above the city, where a dam of stone masonry, laid in cement, is built across the river. The dam is 1,780 ft. long, 6 ft. wide on top and from 7½ to 15 ft. high. The up stream face has a batter of ½ to 1 and the down stream of 1 to 1. The area of the entrance to the canal is 1,463 sq. ft. The canal is 150 ft. wide at the water surface, 106 ft. at the bottom and 11 ft. deep. Seven streams of pure water enter it during its course. Within the city limits three basins were constructed adjoining the canal for settling the water, which, in rainy seasons, carries a large amount of clay in suspension. The first basin receives the water from the canal and is 10 ft. deep. After the heavier particles have been deposited the water is drawn to the second basin, 15 ft. deep, and allowed further opportunity to settle.

This basin, which is 200 ft. square, was originally designed for a filter basin, but the war prevented its completion as such, and the water passes simply through the ¼-in. joints of the brick paving to the third or clear-water basin, 15 ft. deep, whence it is conveyed 3,455 ft. through a 20-in. cast-iron pipe to the pump well of ¼-in. plate iron, 9 ft. in diameter and 24 ft. deep. The bottom of the well is 17 ft. below water surface in the basins.

Two double-acting plunger pumps, built by I. P. Morris & Co., with 18¼-in. barrels and 12-in. plungers, of 36-in. stroke, are operated by a Jonval turbine, working under 11 ft. head and fall. There is also a small auxiliary steam engine with double-acting force pump of 20-in. diameter and 20-in. stroke. The pumps, which have an estimated capacity of 2,000,000 gallons per day, deliver into a 16-in. cast-iron force main, which at 130 ft. from the air chamber branches north for 370 ft. to an elevated tank, and south for 2,360 ft. to Broad and Ninth streets, where four 6-in. mains radiate, supplying the greater portion of the city by direct pumping.

The tank on the north branch of the pumping main is ¼-in. plate iron, is 30 ft. high and 37 ft. in diameter, with a central core 7 ft. in diameter through which a staircase is carried. The tank is supported by 32 cast-iron girders which rest on two annular brick walls 84 ft. high, founded on 3 ft. of concrete. The outer ring is 39.25 ft. in diameter and 3.75 ft. thick, and the inner 12.33 ft. in diameter and 2.67 ft. thick at the bottom. Both are 18 in. thick at top. The water surface of the tank is 106.32 ft. above the pumps, and 96 ft. above Broad and Ninth streets. The tank supplies one line of 6-in. pipe leading south.

Distribution is by cast-iron pipe, of which 21.61 miles are laid, 1.52 miles of which are of 4-in. diameter and the rest 6-in. There are 1,650 taps. The number of fire hydrants is not given. The population in 1880 was 23,023, and the daily consumption 2,409,000 gallons.

The original cost of the works was $200,000. The disbursements to Dec. 31, 1881, were $361,432.-53 and the receipts $131,486,41. For the year 1880 the expenses were $6,786.85 and the receipts $10,833,23.

A. H. Davidson has been the City Engineer and the Engineer and Superintendent of the water-works since January, 1878.

New works for water supply are now in contemplation.

CXXXIX.—DENVER.

Denver, Colorado, in lat. 39° 47′ N., long. 105° W., is on the South Platte River, 15 miles east of the base of the Rocky Mountains. The city occupies a series of plateaux rising gently from the river. It was first settled in 1859. Water-works were built in 1871 by a private company, after the plans and under the superintendence of James Archer, C. E., taking water from the South Platte River.

The first works were within the city limits and pumped the water directly into the mains by Holly steam engines and pumps of 3,500,000 gallons daily capacity. In seven years the company laid 23 miles of pipe, and the rapid growth of the city and the unexpectedly large demand for water for irrigation which is necessary to sustain vegetation in that climate, and the increasing demand for manufacturing purposes, compelled a change in the source of supply.

A stone dam across the river three miles south of the city diverts the water into a canal 30 ft. wide and 6 ft. deep, which at 2¼ miles from the dam enlarges into a lake of about 60 acres area, at an elevation above the stream sufficient to give a head of 28 ft. for water power.

Turbine wheels drive 4 pumps, each of 1,500,-000 gallons capacity per day. Two steam pumps of 3,000,000 gallons capacity each have been added this year. The water is pumped directly into the mains with an ordinary pressure of 50 lbs. and fire pressure of 100 lbs. per square inch. Distribution is by cast-iron pipe of from 20-in. to 2-in. diameter. About 30 miles of pipe are laid, 250 fire hydrants and 2,500 taps. Ten meters are used.

The population in 1880 was 35,630, and the daily consumption 1,250,000 gallons in winter and 3,000,000 gallons in summer.

The capital stock of the company is $500,000. The works have cost $600,000. The bonded indebtedness is $350,000. The expenditures and revenue are not given for 1880. In 1877 the expenditures were, for maintenance $16,719.99, and for interest $24,244.64, and the receipts were $50,046.32. James Archer is the President and Robert R. McCormick the Secretary of the company.

CXL.—DUBUQUE.

Dubuque, Iowa, is in lat. 42° 30′ N., long. 92° W., on the west bank of the Mississippi River, 470 miles north of St. Louis, on an elevated plateau. The site was first settled in 1788 by Julien Dubuque, a French trader. The settlement was abandoned in 1810, and the present town founded in 1833 and incorporated in 1841.

In 1871 water-works were constructed by a private company after the plans of Mr. Pilsbury. Water is taken from a tunnel in the bluffs 2½ miles from the city, which was originally pierced for mining purposes, and is a mile long, from 100 to 200 ft. below the surface and 80 to 90 ft. below the mineral bearing strata. Much of the distance is through solid rock, through frequent fissures in which a large volume of very pure water flows into the tunnel. The temperature of the water is about 45° F. About 500 ft. from the mouth of the tunnel a reservoir 185 ft. long, 55 ft. wide and 18 ft. deep is constructed by dam across a ravine. The surface water is carefully excluded by stone walls. The tunnel water reaches this basin by an arched channel 500 ft. long and 5 ft. wide, which also serves as a reservoir for the storage of 150,000 gallons.

The reservoir is 85 to 120 ft. above the level of the city.

Distribution is by cast-iron pipe, from 12 to 4 in. in diameter. There are 117 hydrants, 501 taps and 12 meters. The city pays $75 per annum each for 100 hydrants, and $50 per annum for each over that number.

The population in 1880 was 22,254. The daily consumption is not stated. The capital stock of the company is $300,000. There is no bonded debt. The revenue is not given. The expenses are small, as only two men are employed on maintenance. N. W. Kimball is the Secretary, Treasurer and General Manager.

CXLI.—EAST SAGINAW.

East Saginaw, Michigan, is on the east bank o the Saginaw River, 16 miles from Saginaw Bay on Lake Michigan.

The city extends about 3 miles along the river and one mile back. It was settled in 1850, incorporated as a village in 1855 and as a city in 1859.

In 1873 water-works were built for the city by the Holly Manufacturing Company, taking the water from the river, through a filter of gravel in a crib, and pumping directly into the mains by a Holly engine. Wood is used as fuel.

The distribution is by cast-iron pipe, of which 21.85 miles are in use, with 149 fire hydrants, 138 gates, 895 taps, and 5 meters. In 1876 18 meters were in use.

The population in 1880 was 19,016, and the daily consumption 1,584,457 gallons. The total cost of the works, including maintenance but not interest on bonds, to Jan. 1, 1881, was $360,314.62.

The expenditures and receipts for each year since construction have been as follows:

Year.	Expenses of management.	Receipts.
1873-4	$10,507.98	$5,739.14
1875	12,602.40	7,632.63
1876	7,420.63	6,847.41
1877	7,805.53	7,479.91
1878	7,770.21	8,188.44
1879	8,353.78	8,522.91
1880	8,571.01	9,560.65

The expense account does not include construction nor interest on bonds. The bonded debt is $350,000. The works are managed by a board of five commissioners. James G. Terry was Superintendent in 1876, and Fred. E. Hoyt has been Superintendent and Secretary since May, 1876.

CXLII.—ANAMOSA.

Anamosa, Iowa, is at the confluence of the Wapsipinicon and Buffalo rivers, 50 miles S. W. of Dubuque.

Water-works were built by a private company in 1875, after the plans of W. C. Weir, C. E., taking water from the Wapsipinicon River and pumping it by a Maxwell pumping engine, with steam cylinder of 16-in. and water cylinder of 10-in. diameter, both having 18.-in. stroke. The lift is 125 ft., and the water is delivered into a brick reservoir 14 by 60 ft. and 15 ft. high, with arched invert and cover. Its flow line is 75 ft. above the main street. In case of fire, the engine pumps directly into the mains.

Distribution is by cast-iron pipe, of which 1.3 miles are in use, all of 6-in. diameter except 550 ft, of 4-in. There are 7 fire hydrants. The number of taps is not given.

The population in 1880 was 2,500, and the daily consumption 24,600 gallons.

The works cost $20,000. The expenses in 1876 were $700 and the receipts $1,643. Later statements are not given.

G. W. Russell is the Secretary of the company.

(TO BE CONTINUED.)

The receipt of statistics, as follows, is acknowledged with thanks: From A. H. Davidson, City Engineer: Statistics of Water-Works of Augusta, Georgia. From G. W. Russell, Secretary: Statistics of Anamosa, Ia., Water-Works. From Isaac S.

Osterhout, Secretary and Treasurer: Statistics of Wilkesbarre, Pa., Water Company and Water Rates. From N. W. Kimball, Secretary, Treasurer and General Manager: Statistics and Water Rate Dubuque, Ia., Water Company. From Fred E. Hoyt, Superintendent and Secretary: Statistics, Water Rates and 8th Report of Water Commissioners of East Saginaw, Mich. From James Archer, President of the Denver, Col., Water Company: Statistics of the Waterworks; Prospectus; Articles of Association; Contracts with the City and Water Rates. From S. M. Gray, City Engineer: Final Report of the Providence (R. I.) Water Commissioners, 1880. From O. H. Ostrander, C. E.: Water Rates and Report of Water Commissioners of Danville, Pa., for 1880.

CORRECTIONS.

Nov. 12, p. 459. *Paterson;* 2d paragraph, 7th line, for "erected over the masonry," read "arched over with masonry."

Same paragraph, 19th line, for "water force," read "water power."

Plymouth; p. 459, 3d column, 11th line, for "wrought-iron cement pipe," read "wrought-iron and cement pipe."

Danville, Pa.; add to the total cost of works as given, $4,125.

For "R. S. Simongton," read "R. S. Simington."

CORRESPONDENCE.

THE DISEASE OF NEW YORK AND ITS REMEDY.

Newport, R. I., Nov. 15. 1881.

EDITOR ENGINEERING NEWS:

The communication, entitled "The disease of New York and its remedy," in your issue of Nov. 12, purporting to be a criticism of the so-called "Separate System of Drainage," is, in my opinion, entirely unworthy of publication in an engineering paper. Without regard to the views embodied in this article, I would say that its tone is such as to make it unfit for appearance in your columns, and I am the more astonished to find it followed by the editorial remark, that this article finds "more congenial atmosphere for ventilation" in your columns than in those of the daily press.

The article pretends to caution the public against "sensational efforts in the alleged interests of the public health," while in reality the very article referred to is in a high degree sensational and alarming.

The papers in *Scribner's Magazine*, to which the above article refers, were written by a man who, not only through his numerous writings on subjects of sanitary science, but also and equally so through his work, stands prominent among the profession, and may well be regarded as a high authority on matters referring to sanitation.

The system of sewerage, which he was the first to introduce into this country, certainly deserves a more earnest review and a fairer criticism than the sweeping remarks in the article signed "W." While I believe that it is the duty of your paper carefully to discuss and weigh the arguments in favor as well as against the separate system of drainage, I do not think the profession can derive any benefit whatever from reading articles full of personal remarks, such as the one in question.

No matter how radical changes it contemplates, the separate system of drainage is worthy the thoughtful consideration of all engineers who make sewerage a special study. It has been advanced as the one most suitable for removing sewage matter from our habitations by men like Chadwick, the Nestor of sanitary science in England, by Messrs. Philips, Menzies, Monson, Carpenter, Lt. Jones and others. It has received the fairest criticisms by American engineers such as Edw. S. Philbrick, J. J. R. Croes, Eliot C. Clarke, Robt. Moore, Chas. H. Latrobe, John Bogart, Rudolph Hering and others.

By reference to the writings of the above-named engineers, it will be seen that even where they dissent from the views of the advocates of the separate system, they are still able, in discussing the question, to divest themselves of any personal feeling, and to treat it simply in its engineering and sanitary aspects.

I beg, furthermore, to differ from your opinion that a "needless alarm is kept up in reference to the dangers to health and life," and I decidedly protest against the view entertained by you that the two professions—namely, that of the doctor and of the sanitary engineer and the plumber, "keep up the panic, in order to derive pecuniary benefit therefrom."

As long as the doctor receives compensation for attending sickness only, I am at a loss to conceive how he can derive pecuniary benefit from advising his clients how to live healthfully, and how to avoid unhealthful surroundings.

The life of a sanitary engineer is not devoted to philanthropy, any more than that of his brother in the profession, the civil engineer. As long as the services of both are in demand, they are certainly entitled to a proper remuneration.

As regards the plumber, too much odium has of late been thrown on his profession. As sanitary science grew, the plumber learned and improved his work. What was considered sufficient ten years ago is not so to-day. Too little attention was then paid to domestic sanitation. Sanitary science has advanced far enough now to teach the *essentials* of a perfect system of house-drainage, and the plumber must improve his work accordingly. These essentials do not, however, include the use of any special "patented" fixtures, though you will readily acknowledge that, when it comes to the selection of special fixtures, such as, for instance, a water-closet, it is hardly possible for the sanitary engineer or plumber to avoid recommending a "patented" article, as—to my knowledge—even the varieties of the worst closets—the pan-closets—are all patented.

The sanitarian, while far from throwing a veil of mystery around his profession, aims, on the contrary, to teach the uninformed public the difference between good and bad work. To quote from the writings of the very author of the Scribner articles: "There is no single item of improved drainage, no detail of the work by which it is to be effected, and no principle upon which it is based, that is not so simple and so easy to be understood that any householder of ordinary capacity may readily comprehend it."

There are and always will be "quacks" in all professions, in the medical, as well as in the engineering profession, but I most respectfully ask you not to make these, to which you undoubtedly meant to refer in your editorial remarks, the representatives of their respective professions. Your remarks, as they stand, reflect most unfavorably upon a branch of the engineering profession to which you yourself profess to belong.

By inserting the above in your columns you would oblige, yours very respectfully,

WM. PAUL GERHARD,
Civil and Sanitary Engineer.

[We cheerfully give place to the above, and articles written in defense of systems or persons attacked will always command from us proper attention, and comments upon editorial remarks will not be excluded from our columns, however uncalled for they may appear, if they carry with them any point.

We propose to offer a fair field for discussion upon professional topics, and we shall claim for ourselves nothing more than what we are willing to accord to others; that is, the privilege of calling things by their right names, so far as we understand them.

The article of "W" will furnish a text upon which we shall enlarge as we find occasion. The separate system we consider as applicable in certain localities, but we consider that the *intelligent* engineer, who advocates it for populous cities, lays himself open at least to suspicion, as to his motives, in view of the present condition of the sewerage question in this country.

We are glad our correspondent admits that there are "quacks" in our profession. We are painfully impressed with the same opinion, and we shall labor to the best of our ability to expose their pretensions—ED. ENG. NEWS].

CURVES IN METRIC SYSTEM.

EDITOR ENGINEERING NEWS:

HUNTSVILLE, Ala., Oct. 31, 1881.

In Mexico and the other Spanish-speaking countries of America, the use of the metric system is prescribed by law; and its use, especially in the field practice of laying out curves for railroads, comes rather awkward to one accustomed to the foot system, where 100 feet is used as the unit of curve measure. A chain of 20 meters divided into 100 links of 2 decimeters each is found to be the most convenient length of chain in practice. Assume this chain as the unit of curve measurement, which has been done by one of the most important of the roads now in progress in Mexico, and for aught the writer knows to the contrary, other roads may be using it also.

In the United States system the degree of curve is determined by the angle subtended at its center by a chord of 100 feet. In our metric system the degree of a curve is determined by the angle subtended at its center by a chord of 20 meters, or in other words, by a chord of 100 links of 2 decimeters each. Tables of radii, ordinates, tangential and chord deflections were furnished, in manuscript, but were found not very convenient. The following was found by the writer to be an easy way of changing our tables in the various field-books so as to meet the requirements of law, and at the same time to use our tables in the field for laying out curves in the metric system.

To get radii, ordinates, tangents, tangent deflections and chord deflections in the metric system, multiply those functions in feet in our tables by .2 and we get the same functions in meters in the metric system as above.

This is not good for ordinates for bending rails, the reason for which is self-evident.

To get radii, ordinates, tangents, tangent deflections and chord deflections in the metric system, divide those functions in feet in our tables by one hundred, and we get the same functions in the metric system in terms of chains and links.

Respectfully, J. S. W.

RAILROAD MAP OF MEXICO.

CITY ENGINEER'S OFFICE,
BOWLING GREEN, Ky., Nov. 14, 1881.

EDITOR ENGINEERING NEWS:

I desire to procure the latest *Railroad Map of Mexico.* Can you help me?

Very truly, M. H. CRUMP,
City Engineer.

[For the past six months we have been trying to obtain a reliable railroad map of Mexico, giving the lines now in operation and those being built, and although we have obtained much information upon the subject, our labors are not yet finished. We visited the Mexican Consul at this city, and wrote to correspondents at the City of Mexico, but as yet have not met with the success we hoped for. One of our subscribers, now residing in the City of Mexico, has kindly agreed to obtain this information. As soon as possible we will publish the map, and in connection therewith such statistics as we can get.]

THE ST. GOTHARD TUNNEL.

[From a Letter to the London Times.]

A glance at the map of Central Europe will show the importance of the line of railway upon which this enormously long tunnel is situated. A territory lying in the heart of the continent, and containing the most delightful scenery in the civilized world, is for a distance north and south of 100 miles (between Lucerne and Milan), and 300 miles east and west (Geneva to Innsbruck), without a line of railway. Nothing but the until recently believed impossibility of working such long subterranean passages has delayed till the present time the construction of railways so urgently needed for the conveyance of the thousands of visitors who annually flock to the summer resorts of grand and beautiful Switzerland. The main line will start from Lucerne and Zurich, the former branch receiving the traffic from the Eastern French and Alsatian lines, while the latter takes that coming from Germany via the Lake of Constance and Schaffhausen. The two forks unite at Zug, and proceeding from there, via the Righi, Goldau, Brunnen, Fluelen, Göschenen-Airolo (the great tunnel), Faido to Bellinzona, divide again at the latter station, for the Lake of Como and Milan; also to Lucarno and the Lake Maggiore to Arona and Milan. The distance from Lucerne to Lucarno will be about 80 miles. From Fluelen, at the southern end of Lake Lucerne, the line climbs the valleys through which the waters of the Reuss thunder down to the lake. On the southern side of the St. Gothard group of mountains the railway, after emerging from the great tunnel at Airolo, descends the valley of the Ticino, through some exceedingly wild gorges, to the Italian lakes above mentioned. There are scores of tunnels, precipices, dizzy bridges and enormous embankments on the whole line, but the chief interest centers in the great tunnel of St. Gothard.

On arriving in the Alpine village of Göschenen the traveler who has visited the western frontier districts of America will be struck with the resemblance of this place to the settlements in the western wilds which are just beginning to assume the garb of civilization. Regularly built stone houses and hotels are surrounded by wooden shanties of simple, unplaned board construction, with the interiors fitted with rough tables, benches and sleeping bunks for the accommodation of the workmen in the Swiss end of the tunnel. The engineer's office of the tunnel division is a small, barren looking room, in which I found M. Zollinger (in charge of this portion of the line), who not only readily acceded to my request to visit the tunnel but volunteered to take me with him on his tour of inspection, which he repeats four times per week.

Entering the tunnel I saw that a narrow-gauge, temporary track was laid on the floor of the passage and that even at the entrance the surface was not yet cleared and ballasted. Our train of side-dumping, four-wheel trucks was loaded with cut stone for the vaulted roof and with workmen going in to begin their turn of labor. The men are all Italians, and I was informed that Frenchmen and Germans had been found unfit for that peculiar work. They were stalwart fellows and looked capable of enduring anything.

The St. Gothard Tunnel, when finished, will measure 8 meters (26⅛ feet) in width and 6 meters (19 feet 10 inches) from the floor to the crown of the arched roof. It is, therefore, wide enough for a double line of rails, although the railway is being constructed elsewhere as a "single" line. The side walls are laid in *moëllon* (ashlar), while the roof, which is a semicircle in cross section, is made of "cut" stone. There are places where it was intended to leave the natural rock as a vaulting, but finally it was decided to put masonry throughout the whole tunnel; as the engineer remarked, "If a piece of stone should fall from the roof upon a railway carriage the passengers would write to the journals, the impression would get abroad that the tunnel was unsafe, and the loss of traffic from such possible causes would eventually pay the extra cost of the masonry." At intervals of 100 meters (330 feet) there are small square openings in the side walls about a yard and a half in depth, where tools may be left, while at every kilometer there are spaces in the side walls large enough to permit a dozen men to stand with their implements to avoid passing trains. A short distance from the entrance we came to the "Bad Place," as it has been christened, where millions of francs have been sunk in a space of 70 meters in length; three years have passed in a continual struggle between an ill-natured freak of Mother Earth in the shape of a stratum of soft, plastic material, and the capital and skill of the contractor, M. Favre, plus the science of his assistants and the railway engineers. Near this *mauvais endroit* M. Favre fell dead from a *coup de sang*, the result, no doubt, of his anxiety over the results of this struggle. Many and costly were the expedients tried, but one after another succumbed to the offended genie of St. Gothard, whose internal economy had been so rudely invaded by these presumptuous sons of Adam. The walls of stone were bulged in like paper, and a second lining of strong masonry was built, but only to share the fate of the predecessor. A short time since a third wall was begun, and it was so constructed as to form an elliptical cylinder, upon which the pressure, from whatever direction it came, or upon whatever point (on the exterior surface) it was exerted, served only to compress more firmly together the stones forming this cylinder, which, of course, is the tunnel itself at this place. Up to the present time this third lining has withstood the utmost efforts of the evidently infuriated genie, and the engineers are confident that the unruly mountain demon has been effectually exorcised. Two miles from the entrance we stopped to exchange our steam power for that of compressed air. These air locomotives make the same noises as the ordinary railway engines when working; they are fitted with whistles, and I was continually shifting about when standing on them, to keep from touching what I could not help thinking were the hot surfaces of an ordinary steam locomotive. The air reservoirs will carry a train from two and a half to three kilometers without reloading when there is a good average pressure in the air compressors at the entrance.

At the four-mile point we reached the terminus of the locomotive track, and my tribulations began in earnest. Horses are in use from this part of the work inward to haul the trucks; they were powerful animals, and in good condition in spite of their subterranean employment. They work eight hours, and it requires three hours to enter and leave the tunnel where they are at work; hence, they have 11 hours out of 24 underground. The action of the water in the tunnel upon their feet and pasterns was found to be so severe from some chemical peculiarity of the liquid that they have to be examined by a veterinary surgeon every time they come out, and have their legs and feet washed with a powerful jet of water with a pressure equal to that of a fire-engine. On the Swiss side there is not much water in the tunnel, the average discharge being 30 liters (8 gallons) per second. On the Italian side, however, there is a flow of 300 liters (80 gallons) per second, sufficient to work a turbine wheel used in ventilating that portion of the tunnel. Our progress was now exceedingly painful; the greater part of the pathway was several inches deep in water; we had to clamber over numerous piles of stones, dodge rapidly-moving trucks and still more dangerous pits, besides shovelfuls of stony fragments or a whole wagon-load of building-stone suddenly dumped by the side of the track. Being dressed like workmen, we were, of course, mistaken for such in the gloomy light—if I may use the expression—and were supposed to be *au fait* to what was going on, and therefore able to look out for ourselves. My lamp got lost in one of my numerous tumbles, and I was then forced to Bashi-Bazouk around for a little light wherever the prospect appeared the most promising. The heat became most oppressive, and I was thankful I had left my coat and waterproof behind; in fact, by the time we had reached the five-mile post I wished that I was naked to the waist, like all the men around me. The air was full of lamp-smoke, which clogged the nostrils, and breathing became a nuisance to a novice in tunnel life. As we approached the dividing line between the Swiss and Italian sides a breeze came through the tunnel which checked my half-formed resolution to "give in" to the terribly hot, stifling atmosphere and make the best of my stumbling way back to Göschenen.

Near the center of the tunnel is the second *mauvais endroit*, which has caused much trouble, although nothing like that resulting from the malevolent efforts of the St. Gothard genie to close up the hole made by intrusive man. Instead of the plastic stratum made by the genie, we have here a singular species of dry, rotten stone, containing a very large proportion of mica. After a short exposure to the air this rotten stratum crumbles to powder. The blasting in the tunnel has all been done by dynamite; until recently this explosive material contained 75 per cent. of nitro-glycerine, but they have lately employed as high as 95 per cent. of nitro-glycerine in blasting out some of the hardest portions of the floor. So violent have been the explosions that I saw scores of holes in the roof from which the arch stones had been shaken, and the suggestion that more of these loosened masses of granite might fall at any moment was most uncomfortable to a man who had only a greasy silk cap on his head. My happiness was not increased while in the gigantic hole by the official statement that over 300 men had been killed and innumerable others wounded, chiefly by explosions and being crushed by passing railway trucks during the progress of the work.

The scene at this *mauvais endroit* No. 2 was intensely interesting—the flitting figures of numerous workmen stripped to the waist, with perspiration streaming down their brawny figures, myriads of lamps swinging in the hands of moving men or hanging by nails driven into the tree trunks supporting the vaulting, trucks loaded with stone pushed rapidly along by stalwart gnome-looking beings yelling "*grazia*" at every step, to warn others of the crushing vehicles' approach; the crashing of masses of granite dumped from the trucks upon the roadside, explosions of dynamite roaring through the subterranean depths and filling the air with the odors of the gases set free, shrieks of the compressed air locomotives from the unseen distance, creaking windlasses, and the cries of men giving directions, all combined, with the stifling heat and smoke-laden atmosphere, to almost induce the visitor from the outer world to believe that he had fallen into the hands of some modern Virgil, and was being conducted through the realms of grim old Pluto.

The tunnel is perfectly straight from end to end, and the engineers met each other so accurately that their center lines were within a hand's breadth of an exact coincidence. As the headings approached each other, the explosions of dynamite were distinctly audible through nearly 400 meters (1,325 feet) of intervening rock. The total length is 15 kilometers (9⅓ miles). The grade ascends uniformly from Göschenen to the summit of the tunnel, which is 1,154 meters above the sea level, and 45 meters (148½ feet) above Göschenen, while it is only 9 meters above the mouth at Airolo. The ascent from Göeschenen to the summit is 5.82 per cent., while the descent to Airolo is 1.25 per cent. The summit of the tunnel is 300 meters (990 feet) below the surface at Andermatt, and 2,000 meters (6,600 feet) beneath the peak of Kastelhorn of the St. Gothard group. This tunnel summit is 1,154 meters, the Mont Cenis Tunnel summit is 1,318 meters, and the Pacific Railway summit is 2,513 meters above the sea level. There are no air shafts in the St. Gothard Tunnel, the two entrances being the only openings. When the mechanical operations cease inside, and the many existing obstructions to a free passage of air, such as scaffoldings, heaps of débris, and unfinished parts near the center, are done away with, there will be nothing unpleasant in the passage through this tremendous tunnel, which is 2,700 meters (1⅝ miles) longer than that through Mont Cenis.

During the regular progress of the work there were 1,000 men employed on the Italian side, and 1,400 on the Swiss; at present, as the former is very nearly completed, the number is less on that side, while it has been increased to 1,600 in the northern end. The regular consumption of oil per day in the workmen's lamps is 300 kilogrammes (about 90 gallons) on the Swiss division alone. With a daily combustion of nearly six barrels of lamp-oil in the tunnel, it is not to be wondered at if there is a greasy odor in the atmosphere. There were about four kilometers of granite rock to be pierced, and the principal composition of the remainder was gneiss, quartzose, schistose, and feldspathic rock. The men are paid by the hour; the daily wages for eight hours' labor are as follows: Masons and higher classes of miners, 5½f. to 6½f. (4s. 6d. to 5s. 6d.); laborers and ordinary miners, 4f. to 4½f. (3s. 4d. to 3s. 9d.). Although I found the interior or more central portion of the tunnel very oppressive, the workmen appeared perfectly at ease, and I have no doubt but what, with a little more gradual penetration to the more distant regions and a few days' seasoning, I should have had no difficulty with the atmosphere. I am thoroughly convinced that people passing through in railway carriages will experience no unpleasant sensations whatever; in fact, it was the constant exertion that upset me quite as much as the atmospheric difficulties. I was assured that the maximum temperature did not exceed 106° Fahrenheit. The contractors state that they will lose heavily in constructing this tunnel, and, although, as a class, they are rather given to mournful assertions as to profits, there is no doubt the St. Gothard genie swallowed up an immense amount of money at *mauvais endroit* No. 1. The engineers assert that the tunnel will be ready for traffic by

Jan. 1 next, although the whole line from Lucerne to Biasca will not be opened until next July.

A LUMBER BONANZA.

A recent exploring party of Col. Mercer up the Spanish River, in Ontario, is said to have discovered vast pine forests, containing over 24,000,000,000 feet of superior lumber, with the best facilities of getting it to market.

NEW CONSTRUCTION IN THE UNITED STATES.

The Investors' Supplement of the *Financial Chronicle* has collated the following figures covering the new mileage already under contract, or for which money provision has been made, and which is to be completed by Jan. 1, 1883.

1. *Between the Atlantic Coast and the Upper Mississippi River and North of the Ohio and Potomac Rivers.*

Name of Co.	Miles to be laid Oct. 1, 1881, to Dec. 31, 1882.
Anderson, Paris & St L.	110
Boston, Hoos. Tun. & W.	300
Bucksport & Bangor	17
Baltimore & Ohio	50
Baltimore & Delta	45
Bridgeton & Saco Valley (Me)	15
Puffalo, Pitts. & West	90
Chi. & E. Ill., Grape Cr. Br.	16
Chi. & West. Mich.	115
Cincinnati & Eastern	5
Chi. & Atlantic (Erie Ex.)	257
Chi., Port. & L. Sup. (400 m)	165
Cin., Ind., St L. & Chi	17
Cin., Wab. & Mich	49
Chi., St. P., Minn. & O	135
Clev., Youngs. & Pitts.	72
Det., Mack. & Marquette.	67
Hartford & Conn. Val.	12
Genessee Valley Canal R.	88
Indiana, Ill. & Iowa, estimated (projected Plymouth, Ind., to Council Bluffs, Ia., 700 miles)	150
Ind., Bl. & West	140
Indianap. & Evansville	95
Louisv., New Albany & St. L.	85
Louisv., New Albany & Chi	65
Lehigh & Hudson River	36
Massachusetts Central	78
Michigan Central	30
Mil., Lake Shore & West.	70
Missouri Pacific, Omaha Ex.	130
N.Y., L. E & West. (Alton, Pa., to Falls Creek)	52
New Bright'n & N. Castle, Pa.	15
N. Y., Lack. & Western	242
N. Y., Susq. & W.	75
N. Y., W. Shore & Buf	200
North Wisconsin	85
N. Y., Chi. & St. Louis	400
N. Y., Pitts. & Chi., est.	300
Owosso & Northwestern Mich.	35
Ohio Central.	49
Ohio Southern	45
Ontonagon & Brule River	20
Peoria & Farmington	22
Port Huron & Northwest	45
Phila., Marlton & Medford	6
Pittsford & Williamston.	25
Pittsburgh & Youghiogheny	56
Portage, Westb. & N. W.	36
Reading & Chesapeake	61
Roch. & Pitts. Exten	120
Tol., Del. & Burl. (all lines)	225
Tol., Ann Arb. & G. T.	22
Ulster & Delaware	4
Vern., Greensburg & Rushv	8
Valley (O.)	17
Wisconsin & Michigan.	40
Wellsville & Bolivia(N.Y.)	19
Wheeling & Lake Erie	35
West Jersey	22
Total	4,791

2. *Between the Atlantic Coast and Mississippi River South of the Ohio and Potomac Rivers.*

Ala., N. O. & Texas Pacific Junction	280
Augusta & Knoxville Extension	40
Attica, Covington & Southern	25
Atlanta & Charlotte	10
Ches., Ohio & Southwestern	53
Cincinnati, Eutaw & Selma	17
Cent., of Georgia—Blakely Br.	16
Cent., of South Carolina —Br	22
Danville, Mockv. & S. W. (Va)	7
Duck River	13
East Tennessee, Virginia & Georgia	221
Elizabeth, Lex. & Big Sandy	139
Elizabeth City & Norfolk	25
Georgia Pacific	350
Jacksonville & St. Augustine	35
Kentucky Central	70
Louisville & Nashville: Pensacola & Selma div.	25
Pensacola & Atlantic	170
Knoxville Branch Extension	72
Marietta & North Georgia	65
Nash., Chat. & St. Louis.	13
Nashville & Florence	10
North Carolina Midland.	105
Natchez, Jackson & Columbus	43
Nashville & Tuscaloosa	12
Norfolk & West—New River Bridge	30
Northeastern (Ga.)	50
Rich. & Allegheny—River Div.	200
Seaboard & Raleigh (N. C.)	97
Savan., Florida & Western	50
Tenn. & Sequatchie Valley	42
Valley of Virginia	36
Total	2,352

3. *Between the Rocky Mountains and Mississippi River and North of the Latitude of St. Louis.*

Atlantic & Pacific, estimated	400
Burlington, Cedar Rap. & No.	73
Burlington & Mo. Riv. in Neb	60
Carson & Colorado	50
Chicago & Northwestern, estimated	100
Chicago, Milwaukee & St. Paul	250
Chicago, Bur. & Quincy—Republican Valley lines and Denver extension	394
Sheridan, Ill., to Paupau.	16
Des Moines & Northwestern	33
Denver, Longmont & N. W	22
Denver & Rio Grande	550
Little Falls & Dakota	50
Minneapolis & St. Louis	60
Missouri, Iowa & Nebraska	30
Northern Pacific	350
Oregonian Br. and Extension	50
Osceola & Des Moines	11
Sioux City & Pacific	120
St. Louis, Des Moines & No.	35
St. P., Minn. & Man., estimated	350
Union Pacific—Oregon & Short Line. Den., So. Park & Pac. Greeley, Salt L. & Pac. Utah Northern. Black Hills Branch.	1,000
Wabash, St. Louis & Pacific	50
Total	4,063

4. *Between the Rocky Mountains and Mississippi River and South of the Latitude of St. Louis.*

Atch., Topeka & Santa Fe	150
Austin & Northwestern estimated (projected 600 miles)	200
Chicago, Texas & Mex. Cent., Dallas to Fort Smith (est)	150
Dallas & Wichita	54
Ft. Worth & Denver City (350 miles projected)	350
Galv., Harrisburg & San Antonio	278
Gulf, Colorado & Santa Fe—Main line (est)	50
Fort Worth extension.	48
Houston E. & W. Texas (est)	100
International & Great Northern	52
Kansas City, Springfield & Mem.	275
Little Rock, Miss. Riv. & Tex	40
Missouri, Kansas & Tex.	100
Morgan's Louisi'a & Tex.	8
New Orleans Pacific	168
N. Y., Texas & Mexico. (Rich. to Brownsville)	150
Northern Pacific	250
Sabine, Texas & E. Beaumont to Woodville in Tyler County (est.)	50
Sabine Pass. & Texas Northern, est. (Marshall to Sabine Pass., 205 miles)	100
St. L., Iron Mt. & South'n (Knobel to La. State line)	250
St. Louis & San Francisco	289
Texas Central	33
Texas Pacific	145
Tex. Mex. (proposed line —San Diego to Houston), est	150
Texas Trunk—Dallas to Sabine Point and branches (350 miles in all)	200
St. L., Tex. & Gulf of Mexico	100
Texas & St. Louis	300
Texas Western (Houston to Fred'b., 210 m.), est.	100
Total	4,140

5. *West of the Rocky Mountains.*

California & Oregon	150	California Southern	116
Oregon, R. & Nav. Co	274		
		Total	540

Grand total ..15,886

REPORTS ON THE SEWERS AND NOXIOUS SMELLS OF PARIS.

[Papers of Institution of Civil Engineers, London.]

The commission appointed by the Prefecture of the Seine to inspect the sewers of Paris has issued two reports. The first treats of the sewers and the discharge of the waters, and the second deals with the methods of removing the bad smells by the various processes proposed.

The branchings off of the sewers have been found much fault with, as checking the flow and giving rise to bad smells, and they are defective in many places. The improvements proposed are a larger discharge of water, a continuous system of cleansing by keeping the bottom portion in constant motion by paddle-boats or other means, and an enlargement of the culverts, especially at the junctions. The newest and largest sewers in Paris, along the Avenue de l'Opera, the Rue Richelieu and the Rue Vivienne, are obstructed by water-pipes, telegraph-wires, etc., and consequently are difficult to cleanse. The section insisted on by the commission as a minimum is a height of 6 ft. 7 in., and a breadth of 4 ft. 3 in. The injection of fecal and organic matters into the water-supplying sewers is strongly objected to; and it is urged that proper filters should be placed at the entrances to the sewers to retain all earth and sand which might tend to accumulate in the sewers and impede the flow.

The second report refers to the various chemical disinfectants which have been proposed, in addition to the main requirement of a much larger daily discharge of water through the sewers. All disinfectants act by means of their primary ingredient, consisting of either chlorine, sulphur, or nitrogen, producing by their decomposition in presence of moisture, hydrochloric, sulphuric, or nitric acid. Three special points were investigated, namely, disinfection, purification and distruction of noxious germs.

In disinfecting, two substances have to be eliminated, namely, ammonia and its fatty aromatic compounds, and sulphuretted hydrogen. All acid compounds easily neutralize ammonia, which, moreover, is but little injurious, and the proposed disinfectants serve to remove it. Sulphuretted hydrogen is more difficult to deal with, especially in the cesspools where it is present in large quantities; whilst in the sewers it decomposes rapidly in contact with the air, and seldom exists in them to any extent except when an unusual quantity of sewage has been discharged at one point. The fatty and aromatic compounds of ammonia, which cause the worst smells, are more difficult to treat on acount of their dangerous volatility.

Purification is a still more difficult problem, as not only have the waters to be disinfected, but the waters dirtied by the chemical products have also to be restored for consumption. From a series of experiments conducted by Messrs. Lévy and Allaire, it appears that the purification effected by each of the proposed disinfectants is very defective, the chloride of zinc and the Rafel powder alone producing admissable results; only a portion of the organic nitrogen in solution is precipitated, and the small germs are unaffected. The action of the disinfectants in purifying cesspools is more satisfactory; but the amount o organic nitrogen neutralized is not at all proportionate to the weight of disinfectant employed.

The germs must be destroyed by the use of antiseptics, such as alcohol, tar, tannin, salts of alumina, etc., or, the best of all antiseptics, cold. In a series of experiments on the action, in this respect, of the six disinfectants proposed, the phenic sulphate of iron proved the best for equal doses. Taking, however, the most effective result tried with a double dose, or 6¾ grains of Rafel powder to a gallon of water, which delayed the appearance of a germ for six days, it would cost £440,000 a year to apply this method to the 104,640,000 cubic yards of water annually discharged into the Seine from the Paris sewers. The operation of the disinfectants would accordingly, as regards germs, be expensive and incomplete, if not useless; and purification by means of the soil still presents the best solution of the problem. The report is summed up as follows: The radical and complete solution to which one must strive to attain being still distant, the disinfectants, in spite of their insufficiency, still preserve their local value.

THE DANGER LINE IN ENGINEERING.*

Among many things well said in this address, we quote as of use to others interested in any way in works of construction, as well as the engineer the following:

"The limit between danger and safety is the one which it must always be your aim to reach. To pass that limit knowingly is dishonest, and should he shunned as you would shun falsehood or theft. In many cases, however, it is not clearly defined; its location is not well known, owing to a want of experience with new materials. I have heard a careful engineer say that he would rather make a thing too strong than too weak, because if too strong very few persons would know of it, while if too weak every one would know of it. To this personal statement of the question it should be added that if too strong, only a percentage of its cost will be wasted; while if too weak, its whole cost and perhaps also some innocent lives will be sacrificed. In all such cases of doubt, be sure above all things that you remain on the safe side. Let no daring ambition on your part, or sordid complaints from others, bring upon you the nightmare of danger dreaded or the remorse of disaster consummated."

THE AGE OF ADVERTISING.

There is a great deal of condensed wisdom in the following from an exchange:

As an illustration of the extent and variety of the advertisements which crowd the columns of the journals of the day it has been said, with but little exaggeration, that if the whole of our modern civilization should pass away as completely as that of some of the ancient monarchies, it would be possible for the historian of that distant future to reproduce in his pages all the most prominent features of its art and literature, its politics and religion, its commerce and its trade, from the advertising columns of some of the great newspapers of our times. The very fact that the present is emphatically an advertising age shows how keenly the importance of the subject is appreciated, and how strong is the general faith in this method of bringing the buyers and sellers, the employer and the employed, and all the business world, face to face with each other. So thoroughly is the present generation impressed with the value of advertising that it is no longer a question of how little a business man can do with, but how much he cannot do without; so that it is no longer to limit and abbreviate his business announcements, but rather to study to extend, amplify and vary them as much as possible. In these days it has become a recognized fact that the business man who does not advertise is lost, and thus, in the eager race of competition, the people of energy are the people who seize upon every method of advertising themselves to the world which ingenuity can devise or enterprise suggest.

HE DID NOT ADVERTISE.

A nervous looking man went into a store the other day and sat down for half an hour or so, when a clerk asked if there was anything she could do for him. He said no, he didn't want anything. She went away, and he sat there half an hour longer, when the proprietor went to him and asked if he wanted to be shown anything. "No,"

*Address by Captain O. H. Ernst, Corps of Engineers, U. S. A., before the graduating class of engineers of Missouri University.

said the nervous man, "I just wanted to sit around. My physician has recommended perfect quiet for me and says, above all things, I must avoid being in crowds. Noticing that you did not advertise in the newspapers I thought that this would be as quiet a place as I could find, so I just dropped in for a few hours of complete isolation." The merchant picked up a bolt of paper cambric to brain him, but the man went out. He said all he wanted was a quiet life.—*Bomfort's Circular.*

AWE-STRUCK ENGINEERS.

At the meeting of the Engineers' Society of Western Pennsylvania, on Tuesday evening, President Metcalf read a statement showing there is in its treasury $304.40 and in the library fund $712.26. The expenditures during the year amounted to $631.50. Jacob Reese read a very interesting paper on electricity and its possibilities. His conclusion was that as soon as some plan is discovered for the oxidation of petroleum or coal by non-luminous combustion Keely's motor will be given a back seat, as one pound of oil will yield 12,000,000 foot-pounds of power, which will reduce the expense of motive power about 95 per cent from the present standard. The paper was so full of startling possibilities that the members of the society did not dare to discuss it.

NOTES.

A New London Bridge.

At various times in the past, efforts have been made to secure the right to build a bridge across the Thames at a lower point in London than the bridge which crosses near the Monument, the bridge known everywhere as London Bridge. Many powerful interests have heretofore interfered, successfully, to prevent the project from being carried out, and, although there is little hope that they can be induced now to give way, the project is to be revived and will soon be laid before the Corporation and the Board of Works. For many years the need of some means by which the vast population of the east and southeast districts might cross the river in other ways than in boats or by going to London Bridge has been deeply felt, and every year it has fast increased. It is not doubted for a moment that the enterprise would be carried through could permission for it be once obtained.

Draining Mexican Marshes by Electricity.

The most extensive application of electricity to engineering ever made will be the plan of Mr. Maxim, of New York, for draining the basin around the City of Mexico, to do which a company has been formed, the funds raised and the contracts signed. The plan in brief is to establish on the western slope of the mountains, where the fall is great and rapid, a number of water wheels sufficient to develop some 20,000 horse-power, and make them drive dynamo-electric machines of high electro-motive power. The current from these machines is to be conducted about twenty miles to a set of electric motors placed on the margin of the lake, and driving pumps, which will require about 7,000 horse-power to work them. The water has to be raised about 40 ft. to clear the ridge, but once raised it has uninterrupted fall toward the Pacific of several thousand feet, so that the descending water is made to keep up the work. The whole apparatus constitutes what Mr. Maxim calls an "electric syphon." The plan will, it is believed, succeed, and thus relieve Mexico from the inundations that have submerged it so much for several centuries.

FOREIGN INTELLIGENCE.

The foreign mails bring us news that the Spanish Government has introduced into the Cortes a bill authorizing the construction of a tunnel under the Pyrenees, and of a railway to lead directly from Madrid to its entrance. If France will undertake an equal share in the expense, Spain offers to provide one-half the funds necessary for the work. It is proposed that the tunnel shall pierce the mountains at a point midway between the Mediterranean and the Atlantic shores.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

The Findlay (O.) Water-works Company was incorporated this week.

Too many dead eels is ascribed by a learned Boston doctor as the cause of the pollution of the public water-supply of that city.

The bids for pumping machinery for Newport (Ky.) Water-works were to be opened last evening, the 18th, it having been deferred for one week.

The Staten Island Water Supply Company have elected Henry G. Stebbins President; Alexander J. Hamilton, Secretary, and Henry L. Norton, Treasurer.

Messrs. Gray & Swift, of St. Louis, have the contract to erect water-works in Vincennes, Ind., they to furnish 144 double hydrants for fire protection at a cost to the city of $9,000.

The Watson Machine Company, of Paterson, N. J., have just completed two large pumps for the Passaic Water Company of Paterson, with a capacity of 8,000,000 gallons per day. The cylinders are 18 inches in diameter with a 6-foot stroke.

Commissioner Thompson says that 5.12 inches of rain had fallen in the Croton Valley during the recent wet weather, and that the water in the Croton Lake had risen from a level of 23 inches below the tip of the dam on Oct. 31 to a point one inch below on Nov. 15.

Tombstone, Arizona, is to be supplied with water by the Wauchauca Water Company. Miller's Cañon, 1,100 feet in elevation above Tombstone, is to be dammed, and a 7-inch wrought-iron pipe, some 24 miles long, will be laid through a valley 1,900 feet lower than the dam, and thence to the point of distribution.

Pittsburgh fire department is to be paid as follows: Chief Engineer, $2,000; Assistant Chief, $1,000; Secretary, $1,100; Superintendent Fire Alarm Telegraph, $1,400; operators, $1,100; repairmen, $1,100; foremen engine companies, $1,020; engineers, $1,000; drivers, $930; hosemen and others, $900.

The Hudson River Tunnel Construction Company was organized in Jersey City on the 14th inst. to build the tunnel under the Hudson River between New Jersey and New York, now under construction. The capital is $2,000,000. Trenor W. Park was chosen President.

The injunction suit of Lewis D. Campbell vs. The Hamilton, O., City Council and the Water-works Company was commenced on the 14th. The suit is brought to enjoin the City Council from contracting with the said Water-works Company for the construction of the works. Some interesting developments are to be looked for.

The proposal to issue city bonds to buy the water-works at St. Paul, and extend the same, was more opposed than was expected, but was adopted by over 200 majority. When the purchase is made the water supply is to be increased and the service extended to all parts of the city.

There will be a special corporation meeting at Engine Hall, Bellows Falls, Vt., Monday afternoon next, to see if the corporation will authorize the purchase of an additional supply of water to be brought to Minard's pond, which supplies the village. They will also talk about authorizing the water commissioners to lay pipes on two new streets.

City Works Commissioner French has sent a communication to the Brooklyn Board of Aldermen requesting the appropriation of $180,000 for the pruchase of an engine of 15,000,000 gallons capacity and the construction of a new pumping-station at the Ridgewood Reservoir. The communication was referred to the Committee on Water and Drainage.

A successful exhibition of the efficiency of the New York Fire Department was made on Wednesday on the plaza at Union square, before Lord Beaumont and Mayor Grace. Forty-six seconds after Lord Beaumont sounded the alarm, Engine No. 14 was on the ground, and in less than one minute had a hose attached to a fire-plug. Truck No. 3 was on the ground in 1 minute and 30 seconds, and within 4 minutes Engines Nos. 18 and 33 arrived. Lord Beaumont complimented the firemen for their promptness.

The firemen of Davenport, Ia., are holding a fair for the singular purpose of raising money to buy horses with which to pull their machines to fires. The council has been petitioned in vain to supply this want, and now the fire-fighters have taken the matter into their own hands. A subscription list for the same purpose is being circulated among the business men. There is serious trouble between one company and the council on the subject, and it is probable that the fire company will disband. The members of the council allege economy as the reason for their action.

The engine now being built for the Parkdale, Ont., water-works is intended to supply a population of 10,000, and, it is hinted, will be equal to the task of supplying Yorkville and Parkdale with water for the present. The engine house is sufficiently large to accommodate another engine of the same size, and in the event of extending the water-works of Parkdale to Yorkville, the villages of Brockton and Seaton would also take water, as the water main to Yorkville would pass through these villages. This would in some measure reduce the cost of laying a main to Yorkville. The cost of laying a ten-inch main to the Yorkville reservoir is roughly estimated at $15,000.

A company has been formed in McKeesport, Pa., called the Gas-light Transportation Company of New York, and large tracts of choice gas coal lands have been secured in the vicinity of McKeesport for the purpose of manufacturing gas near the mouth of the mine, and transporting it through immense pipes to all the large cities of the Atlantic States. Pumps to draw gas from the works to points of delivery are to be made from special designs, and will be located about twenty-three miles apart. The company claim that they can supply a superior quality of gas to gas companies and private consumers for lighting and heating purposes at greatly reduced prices. Competent engineers have pronounced the project feasible. It is said to be the intention to connect with Philadelphia and New York as soon as the works are completed, and afterward extend the systems to other cities and towns.

The Davidson Steam Pump Co., 41 to 47 Keap street, Brooklyn, N. Y., are at present employing over one hundred men, working over-time, and have orders ahead sufficient to keep them busy for over six months. Among other contracts, they are engaged in constructing four large compound condensing engines, each with a daily capacity of two and a half million gallons, for the national government, for use by the Mississippi River Commission on the improvement of that river. They are also building, and will have completed in about sixty days, the new pumping machinery ordered by the Indianapolis (Ind.) Water Co., from the designs furnished by Wm. E. Worthen, hydraulic engineer, of this city. This machinery will have a daily pumping capacity of about five million gallons, and will doubtless supply all deficiencies heretofore existing in the water supply in that city. The mechanical part of the business of the Davidson Steam Pump Co. is under the charge of Robert W. Hamilton, Esq., the well known hydraulic engineer, and the company are constantly receiving unsolicited testimonials to the high economy and exceeding efficiency of the products of their establishment.

BRIDGES.

Main Street Bridge, over the St. Joseph River, at Mendon, Mich., was washed away by high water on the 12th inst.

There has been used in the construction of the Albany & Greenbush Bridge 2,375 piles, 335,286 ft. of spruce timber; 165,000 ft. of pine; 4,880 yds. of masonry; 5,228 sq. ft. of coping, and about 54,000 lbs. of iron, bolts, spikes and clamps.

The great bridge of the Pekin & Southwestern Railroad over the Kankakee River, four miles below Wilmington, Ill., was swept away on the 12th by the flood, and the Wabash railroad bridge over Forked Creek, near the same place, was also carried away by the same agency. The former bridge was blown off the piers but a few weeks ago in the hurricane, and the repairs were just about finished before the last destructive storm.

Chicago Viaducts.—Randolph Street Viaduct—Built entirely by the Illinois Central Railroad Company; length, 1,735 ft.; strength, 2,500 lbs. moving weight to lineal foot; cost, $103,000. Sangamon Street Viaduct—Built by the city; length, 458 ft.; strength, 3,000 lbs. moving weight; cost, $90,000, for which railway companies were assessed $57,000. Harrison Street Viaduct—Built by the city; length, 498 ft.; strength, moving load of 3,500 lbs.; cost, $107,000, for which railway companies were assessed $78,000. Polk Street Viaduct—Built by the city; length, 346 ft.; cost, $115,000, for which roads will be assessed proportionately. Halsted Street Viaduct—Built by the city, and paid for by the city; length, 178 ft.; strength, 5,400 lbs. moving weight; cost $18,000.

RAILROADS.

The Junction Railway Company, of Portland, Me., capital stock $2,000,000, was organized this week.

The Choctaw Indian Nation has granted the right of way to the St. Louis & San Francisco Railway through its territory.

City of Mexico, Nov. 10.—Congress has reinvested the President with authority to grant railroad concessions and empowered him to alter existing concessions.

A new joint stock company was organized in Bellaire, O., Nov. 15, with a capital of $200,000. It will build a rolling-mill and engage in the manufacture of sheet iron.

The Chicago & Northern Railway Company was incorporated in Illinois on Monday, capital $1,000,000, to run from Chicago northerly to the State boundary.

Murray Mitchell's surveying party on the Gatineau Railway have found a good line 42 miles from the Desert towards Hull, which place they expect to reach inside of three weeks.

The company organized to extend the Ohio Central Railway to Newark, O., is called the Newark & Edgefield Railway Company. Capital, $50,000. The Ohio Central is backing the project.

Prominent New York capitalists are about completing negotiations for the purchase of 1,000,000 acres of land belonging to the Florida Land Company. The price to be paid is $1 per acre, and the purchasers are to have the privilege of purchasing 2,000,000 additional acres.

The work of surveying the route of the Boston, Hoosac Tunnel & Western Railroad, Saratoga Branch, was commenced in Troy on the 16th inst. The engineers have located the line in River street, and propose to occupy a mile and a half of that thoroughfare.

The Brush Electric Light Company, of Louisville, Ky., filed articles of association on the 15th. Capital stock, $150,000. Incorporators and directors are Jas. D. Lithgrow, Jacob L. Smyser and Theo. Wm. Tobin. All the capital stock is subscribed.

The Kansas & Texas Southern Railroad Company has filed a charter with the Texas State Department. The capital stock of the company is $6,000,000, and the road to be built will be of standard gauge. The southern terminus will be Presidio, on the Rio Grande.

A large surveying party, under pay of the Pittsburgh & Western Railway, are making a complete survey of the Fairport harbor in connection with the terminus of the Painesville & Youngstown (O.) Railroad, which has lately passed into the former road's hands. Workmen have begun the work of widening the gauge of the latter road, and it will soon be put in first-class order.

The Cincinnati, Shawnee & Wheeling Railway Company, capital stock $3,000,000, has been incorporated

for the construction and operation of a line of railroad from the city of Bellaire, Belmont County, to the city of Cincinnati. The principal office will be in Logan, Hocking County, with branch offices in Cincinnati and Bellaire.

The Ogden Mine Railroad, crossing and connecting the most important iron mines and veins in the upper portion of Morris County, has been leased by the New Jersey Central Railroad Company for 999 years, and the company will at once connect with its High Bridge Division and otherwise improve the property. The rental paid for the same by the New Jersey Central is equal to 5 per cent. on the capital stock of the Ogden Mine Railroad.

A direct line for the Toronto & Ottawa road has at last been located between Peterboro' and Casselman, or High Falls, a distance of 182 miles. The work on the section between Madoc and Perth is being pushed rapidly, and the company has telegraphed to a number of places in the Province for more men. All the laborers obtainable will be immediately employed. Two parties of engineers are going over the road taking soundings at creeks and rivers and making estimates of the cost of bridges, culverts and other structures. Mr. Patterson, the chief engineer, left yesterday morning with his party, to survey the district through which the proposed branch between Wick, on the Toronto & Nipissing Railway, and Manilla, on the Port Perry road, will run. Mr. J. Campbell is busily engaged in purchasing the right of way all along the line, and all the necessary preparations are being made for the resumption of work next spring with a large gang of men.

President Henry Villard, of the Oregon Railway & Navigation Company, has issued his annual report to the stockholders. The company has, during the past year, completed 250 miles of standard-gauge road, and before Jan. 1 next Mr. Villard expects that fully 300 miles of new road will be completed and in active operation. There has been constructed 1,464 ft. of Howe truss and 11,268 ft. of trestle; and the large bridge over Snake river, two miles below Texas ferry, representing an aggregate length of 1,415 ft., is now in process of construction. All questions of right of way have been settled at comparatively small cost to the company, and with scarcely any litigation. The right of way across the Umatilla Indian reservation on the Baker City line was amicably settled at a council, by an agreement on the part of the company to pay the Indians $2.50 per acre for all wild lands, and $27.50 per acre for cultivated lands, necessary for the roadway and depot grounds located within the reservation, the whole cost of which will be about $3,000. There was expended during the year, for railroad construction, $4,247,468.74; for other constructions, $240,-354 91; for railroad equipment, $296,558.30; for other equipment, $116,680.74. The several lines operated by this company represent a total of 1,591 miles. The total receipts from all sources during the year were $9,509,620.50; total disbursements, $8,014,360.80. The traffic gross earnings were $3,730,245.60; the operating expenses, including taxes, $2,063,383,77, showing the net earnings to be $1,666,861.83. The report enlarges somewhat on the consolidation recently effected with the Northern Pacific Railroad, and the transfer of the controlling power over both corporations to a third corporation, the Oregon & Transcontinental Company, having an authorized capital of $50,000,000.

THE HUDSON BAY ROUTE.—The explorations made by Dr. Bell, in connection with the Hudson's Bay region, and the practicability of the successful navigation of the Straits of Hudson's Bay for purposes of commerce have caused some interest to be felt in the question. The Nelson Valley Railway and Transportation companies have selected the harbor of Churchill on the west side of the Hudson's Bay as their point of junction between the railway and navigation. It lies directly opposite to the western outlet of the Straits, and offers a free and unobstructed approach from the open sea. It is said to be the finest harbor on the west side of the bay, is entered by a channel about half a mile wide and twelve fathoms deep. The depth of the harbor is understood to be from six to eight fathoms, with excellent holding ground. The east side affords admirable sites for the construction of wharves. The distance from Churchill harbor to Liverpool by the Hudson's Straits is 2,926 miles, while from Montreal via Cape Race it is 2,990 miles, and from New York via Cape Clear 3,040 miles. If the anticipations of the promoters are realized, it will furnish a seaport existing in the very heart of the continent, more than 1,500 miles nearer than Quebec to the center of the Northwest Territory. Churchill harbor is only about 400 miles from the edge of the great wheat field of the Northwest Territories, as short a distance as from Quebec to Toronto. A line of railway of 350 miles will connect the port of Churchill with Lake Winnipeg, and thence by navigation to the city of Winnipeg, or by a comparatively short branch from the head of Lake Winnipeg, it will connect with the railway systems of the Northwest. In the ground from Lake Winnipeg to Churchill there is a gradual descent of 710 feet, or about two feet to the mile, and the explorations already made by the company's chief engineer and staff of assistants are in the highest degree favorable as to the country being a satisfactory one over which to construct a railway.

NEW PROJECTS.

New York capitalists are to complete the Columbus (O.) & Northwestern Railroad.

The Burlington & Missouri has surveyed a route across the Kansas Central, near Valley Falls, leading to Topeka.

The building societies of England now have an aggregate capital of $151,000,000. The societies number 876.

Messrs. Meyer & Bachman, whose brewery on Staten Island was recently burned, have commenced to rebuild and will spend $300,000 on their new structure.

Movement is taking practical form to build a branch of the Ohio Central to Newark, O. The citizens of the latter place favor it greatly.

A new railroad has been incorporated in Arkansas to run from Texarkana to Greenville, Miss., and called the Mississippi, Arkansas & Texas. Capital, $3,000,000.

The New York Central & Hudson River Railroad Company has filed a plan for the erection of an engine-house and turn-table at Twelfth avenue and Seventy-first street, to cost $90,000.

The rumor that the Atchison, Topeka & Santa Fe will build a line from Topeka to Leavenworth seems to have some foundation, and it is probable that the line will be built.

The Kansas Central Railroad, from Leavenworth to the northwest, is completed to Clay Center. An extension of twenty miles to Star Center has been commenced

Havemeyer & Elder's new sugar house on First street, between South Second and South Third streets, Brooklyn, will be eleven stories in height and will cost about $100,000.

SOUTH BEND, Ind., Nov. 13.—The storms of the past two days have done thousands of dollars' worth of damage throughout this county. Streams are swollen, fields overflowed, bridges washed away, and travel greatly interrupted.

The Wabash Railroad Company has a diver at work in the construction of their bridge across the Des Moines River at Des Moines, who remains under water five hours at a time, digging and shoveling mud from the bottom of the river.

A report has gone forth that the Minneapolis & St. Paul road has decided to build from Ogden, on the Northwestern road, to Greenfield, Iowa, where it will connect with the branch of the Chicago, Burlington & Quincy road.

The contract for grading, bridging, and piling of that portion of the Duluth & Winnipeg Railroad extending from Duluth to the Mississippi, about 150 miles in length, has been let to E. C. Davis & Co., of Boston. Work is to be commenced at once.

The charter of the Galveston & Rio Grande Railroad Company, just filed, provides for a line from Galveston to Laredo, with a branch from a point in Live Oak County to Rio Grande City. The capital stock is $12,-500,000.

The locating of the line for the Oley Valley Narrow Gauge, north from Monocacy station, on the Reading Railroad, will begin at once, and it is expected that by Dec. 15 proposals will be invited for the grading of same, so that ground can be broken before the end of the year.

A New York syndicate, of which J. Conduit Smith, one of the builders of the Chicago & Atlantic road, is the head, has been formed to build the Southern Georgia & Florida road from Macon to Jacksonville, via Dupont. It will be 161 miles long and will cost $2,-500,000.

It is said that during the coming winter and spring the West Jersey Railroad double track will be extended from Wenona to Glassboro. The intention is to lay it a certain distance at a time, until the whole route from Camden to Atlantic City is supplied with a double roadway.

The entrance to the earth's interior is apparently located under a portion of the Lake Erie & Western roadbed between Muncie and Albany, Ind. A large hole opened suddenly one night, and all efforts to find the bottom proved futile. A pile, 73 feet long, sunk out of sight, and when large quantities of stone are dumped into the hole they cannot be heard to strike bottom.

An Urbana (O.) dispatch says: "The proposition of an Eastern company to construct the Columbus & Northwestern Railroad upon certain conditions has been accepted by the board of directors. R. G. Dun, T. J. Glendenny, S. S. Leedom, Ed. Jennings and Dr. Ayres were appointed a committee to complete arrangements with the company."

The organization of the Louisville, New Albany & Jeffersonville Belt Railroad Company was completed on the 12th by the election of Colonel Bennett H. Young, of Louisville, President; S. P. Walters, of Richmond, Ky., Vice-President; George Lyman, of New Albany, Secretary and Treasurer. It is expected to complete the road in four months.

The Canal Dover & Cleveland Railroad Company, capital stock $750,000, in shares of $100 each. The road will run from Canal Dover, Tuscarawas County, to Cleveland, passing through the counties of Tuscarawas, Stark, Summit and Cuyahoga. It is the virtual building over of the old line of railway from Canal Dover to Canton, on account of not being able to come to terms with existing lines.

Three bids for the building of a new wooden pier, 542 ft. 6 in. long and 75 ft. wide, at the foot of Laight street, to be known as new Pier No. 28, North River, were opened by the Dock Commissioners at their meeting on Wednesday. Joseph Walsh offered to do the work for $68,000, Ross & Sanford for $58,228.58 and John Gillies for $56,000. To Gillies was awarded the contract, subject to the approval by the Controller of his securities.

"Brick" Pomeroy is making himself useful out West. He is at the head of the Atlantic & Pacific Tunnel Company. The tunnel is for mining purposes, is located 16 miles northwest of Georgetown, Col., and will be about five miles long when completed. It is stated that the Union Pacific Railroad officials are negotiating to secure the tunnel as a part of their railroad system through the Rocky Mountains. The tunnel, if completed, is calculated to save about 400 miles distance to San Francisco.

Articles of incorporation have been filed in the Illinois Secretary of State's office for the Chicago & Southeastern Railway Company, with a capital stock of $700,000, to construct a railroad from a point in Cook County to a point on the Indiana State line in the county of Kankakee or Iroquois, passing through Will County. The incorporators are John L. Beveridge, Eugene Ellery, David B. Dewey, Alexander Schrader and Robert R. Kendall.

The survey of the proposed new railroad from Danby to Whitehall, N. Y., commenced on the 14th. This railroad, it is stated, will be extended to Sackett's Harbor, on Lake Ontario, and if built will form another line, by way of the Bennington & Rutland Railroad between Chicago and Boston, connecting with the Hoosac Tunnel route at the Hoosac junction by an extension road 18 miles long, to North Adams, Mass.

The Cincinnati, Selma & Mobile Railroad Company was organized in Cincinnati on Saturday, the 12th with a capital stock of $1,500,000, two-thirds of which has been subscribed by Cincinnati capitalists, including Theodore Cook, Thos. T. Gaff, E. M. Johnson, A. H. Bugher, Joseph W. Wayne, Alexander McDonald, G. F. Doughty, C. B. Wright, Bradford Shinkle, Lewis Krohn, G. H. Muhlhauser, the Ryan brothers, M. S. Hoffheimer and George Hafer. The balance of the stock is held by Mr. Fred Wolffe and New York parties

DAYTON, O., Nov. 13.—Mr. Fred. Reibold has just returned from the East, where he has been negotiating the bonds of the proposed Dayton & Hocking Valley Railroad, and in an interview states that the English Syndicate, represented by Mr. James Taylor, have agreed to take $21,000,000 worth of bonds at 6 per cent. The route is not yet definitely located. Springfield is working hard, and with her usual liberality offering great inducements to the company to make that place the terminus of the Ohio Division; $100,000 have been subscribed there. On the other hand, Dayton capitalists are putting in heavy bids. One of them proposes to erect one of the largest rolling-mills in the State, if the road should be run through here. One of the incorporators also makes the statement that it is the intention of the company to establish lines to St. Louis, Chicago and Cincinnati.

Work on the Canada Atlantic Railway continue brisk In the gravel pit at Moose Creek, which is just half-way between Ottawa and Coteau, 40 miles each way, some 125 men are at work night and day, a steam shovel being used, while the electric light is being employed by night. There are between 550 and 600 men employed on the railway. A party of engineers are locating the line south of the St. Lawrence to Rouse's Point. Plans for the bridges on the remaining section of the road and for the station and freight buildings in Ottawa are in course of preparation, and contracts for the same will be given out at an early date. The branch line to the Chaudière is being finally located. The company is building this road, it is said, entirely on its private means and the subsidy of $4,500 per mile. The company call for tenders for clearing and grading 22 miles of road between High Falls & Ottawa, to be completed by the 15th of June next. The contract for the construction of the new lock gates of the Cornwall Canal has been given without tender to Mr. Gordon, of Cornwall. The Board of Dominion Land Surveyors is sitting in Ottawa, and will continue its session through the week, after which an adjournment to Winnipeg will be made to examine candidates there. There are nine luckless candidates under examination.

The long talked of consolidation of the iron and steel interests of St. Louis and vicinity has been finally effected, but not so many companies have joined the syndicate as at first proposed. The new company will consist of the Vulcan Steel Works, of South St. Louis, the Pilot Knob Iron Works, Iron Mountain Railroad, and the Grand Tower Mining and Manufacturing Company, of Illinois. The new directory will be composed of six New York members, as follows: Jay Gould, Thomas Dickson, C. K. Garrison, Solon Humphrey, H. G. Marquard and Legrand B. Cannon; and of seven St. Louis members, as follows: Charles P. Chouteau, Thomas E. Tutt, Carlos S. Greeley, J. H. Mason, Ed Walsh, Jr., D. K. Ferguson and E. A. Hitchcock. The latter gentleman will be the President of the new corporation. Extensive repairs, additions and changes will be made to the property of the consolidation, among which will be a mammoth steel wire mill, to be erected on the recent purchase of five acres of ground adjoining the Vulcan Steel Works on the north, which will employ 200 men, a new furnace and several new converters in the Vulcan works, and various other improvements and extensions. The company expect to spend half a million dollars in putting their property in thorough and efficient condition for a very large and growing business.

The city of Paterson, N. J., has lately let out contracts for two large sewers. One 2,340 ft., 36-in. egg-shaped brick; the other 1,640 ft., 24-in. egg-shaped brick, and about 800 ft. 18-in. pipe. They are now well under way. approximate cost $23,614.